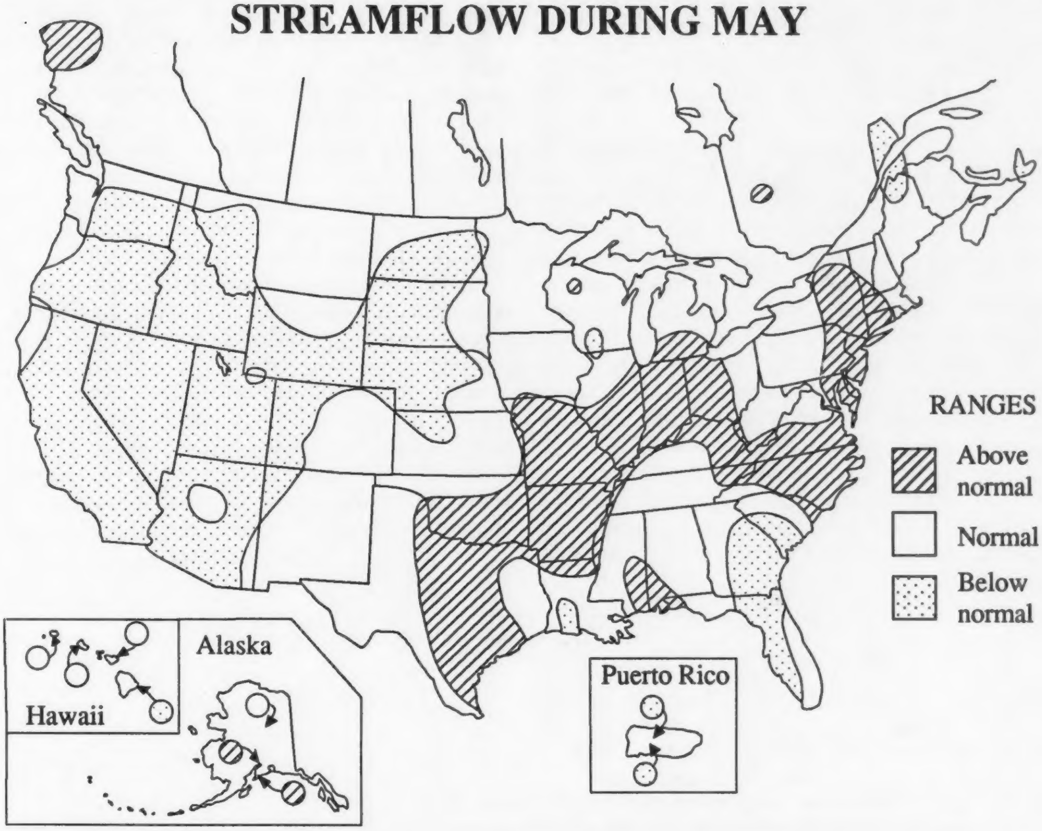
National Water Conditions

UNITED STATES
Department of the Interior
Geological Survey

CANADA
Department of the Environment
Water Resources Branch

MAY 1990

STREAMFLOW DURING MAY



Record-breaking floods, caused by heavy rains, occurred in Oklahoma, Arkansas, Texas, Illinois, and Iowa. The floods in Texas occurred about a year after the the severe May and June 1989 floods in the Houston area. However, the heavy rains fell mostly in areas where precipitation had been near normal in previous months. As a result, drought conditions continued in much of the West and parts of the Southeast.

Streamflow was in the normal to above-normal range at 74 percent of the index stations in southern Canada, the United States, and Puerto Rico. Below-normal range streamflow occurred in 28 percent of the area of southern Canada and the conterminous United States during May. Total May 1990 flow for the index stations in the conterminous United States and southern Canada was 15 percent above median.

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged 14 percent above median and in the normal range during May.

Monthend index reservoir contents for May 1990 were in the below-average range at 32 of 100 reporting sites, and were also in the above-average range at 32 reservoirs.

Mean May elevations at the four master gages on the Great Lakes (provisional National Ocean Service data) were in the below-normal range on Lake Superior and Lake Huron, and in the normal range on Lake Erie and Lake Ontario.

Utah's Great Salt Lake began its seasonal decline, falling 0.40 foot to 4,204.30 feet above National Geodetic Vertical Datum of 1929 during the month.

SURFACE-WATER CONDITIONS DURING MAY 1990

Severe floods, caused by heavy rains, occurred in some areas of the central United States, beginning near the end of April and continuing through almost the end of May. Texas and Oklahoma were two of the States most affected by floods, with the floods in Texas occurring about a year after the the severe May and June 1989 floods in the Houston area. However, the heavy rains fell mostly in areas where precipitation had been near normal in previous months. As a result, drought conditions continued in much of the West, particularly in California, the Dakotas and parts of adjacent States, and also in an area centered on southeastern Georgia extending into Florida and South Carolina.

Streamflow was in the normal to above-normal range at 74 percent of the index stations in southern Canada, the United States, and Puerto Rico during May, compared with 65 percent of stations in those ranges during April, and 74 percent of stations in those ranges during May 1989. Below-normal range streamflow occurred in 28 percent of the area of southern Canada and the conterminous United States during May compared with 24 percent during April and 19 percent during May 1989. Total May 1990 flow of 3,536,100 cubic feet per second (cfs) for the index stations in the conterminous United States and southern Canada was 15 percent above median after a 32 percent increase in streamflow from April to May, and 12 percent more than flow during May 1989.

Seven new monthly extremes (table on page 10), three lows and four highs, occurred at streamflow index stations during April compared with six new highs during March. The new lows were at stations in Wyoming, Utah, and Arizona, while the new highs were at stations in Virginia, Missouri, Arkansas, and Alaska. Hydrographs for the index stations at which new extremes occurred are shown on page 11.

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged 1,735,800 cfs (14 percent above median and in the normal range) during May, 14 percent more than during April. Flow of the St. Lawrence River was in the normal range for the third consecutive month. Flow of the Mississippi River was in the above-normal range after a normal-range April, and flow of the Columbia River was in the below-normal range after a normal-range April. Hydrographs for both the combined and individual flows of the "Big 3" are on page 12. Dissolved solids and water temperatures at five large river stations are also given on page 12. Flow data for the "Big 3" and 42 other large rivers are given in the Flow of Large Rivers table on page 13.

Monthend index reservoir contents for May 1990 were in the below-average range (below the monthend average for the period of record by more than 5 percent of normal maximum contents) at 32 of 100 reporting sites, the same as during April, including most reservoirs in Nebraska, the Dakotas, Wyoming, Idaho, Washington, California, Nevada, Utah, and Arizona. Contents were in the above-average range at 32 reservoirs (compared with 39 last month) , including most reservoirs in Maine, New Hampshire, New Jersey, the Tennessee Valley, Minnesota, Oklahoma, and Texas. Reservoirs with contents in

(Continued on page 10)

CONTENTS

TOTAL PRECIPITATION (INCHES) APRIL 15-MAY 19, 1990, CENTRAL UNITED STATES

(From *Weekly Weather and Crop Bulletin* prepared and published by the NOAA/USDA Joint Agricultural Facility)

FLOODS IN OKLAHOMA, ARKANSAS, TEXAS, ILLINOIS, AND IOWA IN APRIL-MAY 1990

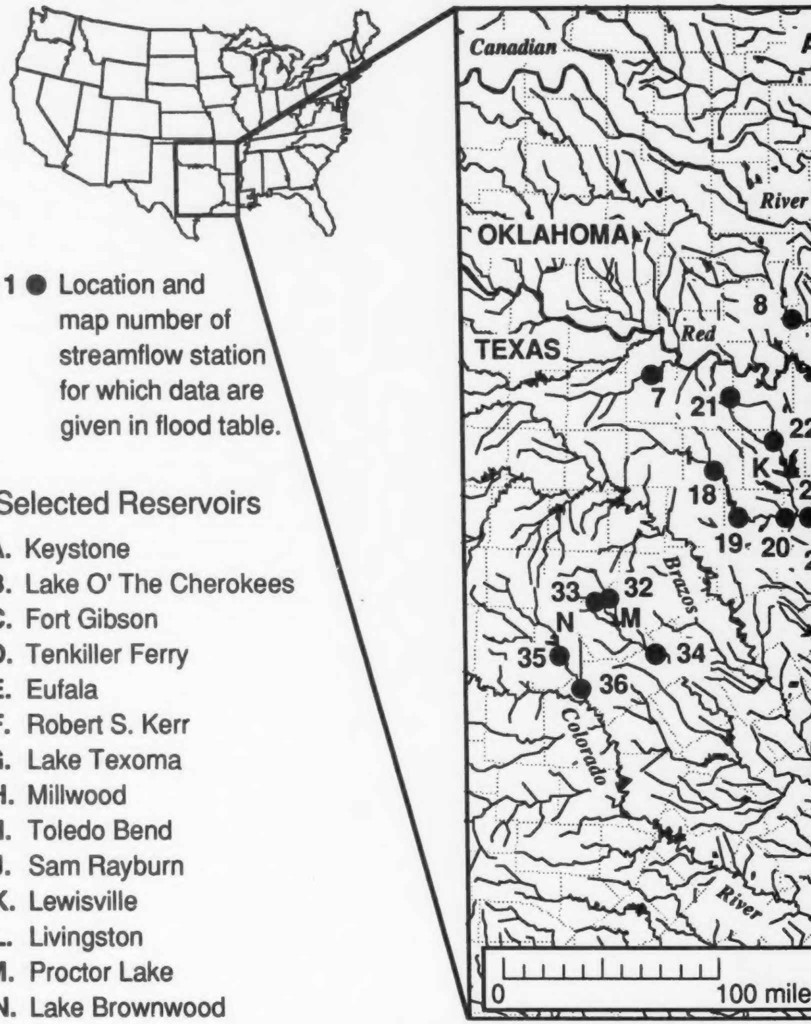
Heavy rains began falling in the south-central United States about mid-April. The rains continued, sporadically at times, torrentially at others, through mid-May. Heavy rains also fell in Illinois and Iowa. Severe flooding occurred in much of the area between the Texas Gulf Coast and Lake Michigan, some of it record-breaking. The map above shows precipitation for April 15-May 19, 1990, and indicates the variability of rainfall in that area. Comparative precipitation for selected river basins for March 1-May 31, 1990, are given on page 6. Maps showing both precipitation and percentage of normal precipitation for the United States March 1-May 31, 1990 (page 8), show the extremely wet nature of the three months as a whole. (Table and map from *Weekly Weather and Crop Bulletin* prepared and published by the NOAA/USDA Joint Agricultural Facility.)

Peak discharges at many streamflow stations in Oklahoma, Arkansas, Texas, Illinois, and Iowa exceeded previous records or the 100-year flood. (See maps and tables on following pages.)

Record-breaking or near-record-breaking flood peaks began occurring in Texas during the last week of April (Leon River near DeLeon) and continued to occur through May 23 (Trinity River at Liberty). Contents of the 12 index reservoirs in Texas were about the same at the end of both April and May, but contents of some smaller reservoirs exceeded those of previous record (see table on page 6).

(Continued on page 6)

FLOODS IN OKLAHOMA, ARKANSAS AND



1 ● Location and map number of streamflow station for which data are given in flood table.

Selected Reservoirs

A. Keystone
B. Lake O' The Cherokees
C. Fort Gibson
D. Tenkiller Ferry
E. Eufala
F. Robert S. Kerr
G. Lake Texoma
H. Millwood
I. Toledo Bend
J. Sam Rayburn
K. Lewisville
L. Livingston
M. Proctor Lake
N. Lake Brownwood

D TEXAS IN APRIL-MAY 1990

Provisional data; subject to revision

FLOOD DATA FOR SELECTED SITES IN OKLAHOMA, ARKANSAS, AND TEXAS, APRIL–MAY 1990

Map number	WRD Station number	Stream and place of determination	Drainage area (square miles)	Period of known floods	Maximum flood previously known: Date	Maximum flood previously known: Stage (feet)	Maximum flood previously known: Discharge (cfs)	Maximum during present flood: Date	Maximum during present flood: Stage (feet)	Maximum during present flood: Discharge: Cfs	Maximum during present flood: Discharge: Cfs per square mile	Maximum during present flood: Recurrence interval (years)
		OKLAHOMA										
		ARKANSAS RIVER BASIN										
1	07197000	Baron Fork at Eldon	307	1948-	Oct. 1, 1986	25.78	55,500	May 3	25.91	57,300	187	(1)
2	07231500	Canadian River at Calvin	[2]23,151	1905-	May 11, 1950	17.35	174,000	3	19.29	170,000	9.59	(3,4)
3	07245000	Canadian River near Whitefield	[2]37,876	1938-	May 10, 1943	25.50	281,000	3	25.23	238,000	6.28	[4,5]2.85
		ARKANSAS										
4	07250550	Arkansas River at Dam 13, near Van Buren	[2]128,306	1833-	Apr.16, 1945	38.10	850,000	5	36.10	401,000	3.13	90
5	07258000	Arkansas River at Dardanelle	[2]131,429	1927-	May 13-14, 1943	43.6	683,000	4	42.1	445,000	3.39	14
6	07263450	Arkansas River at Murray Dam at Little Rock	[2]135,789	1833-	May 27, 1943	30.05	536,000	8	27.55	408,000	2.00	14
		TEXAS										
		RED RIVER BASIN										
7	07314900	Little Wichita River above Henrietta	1,037	1953-	May 1, 1966	18.28	7,630	4	24.90	14,000	13.5	[5]1.04
		OKLAHOMA										
8	07331000	Washita River near Dickinson	7,202	1928-	May 30, 1987	45.24	105,000	3	44.30	[6]123,200	16.8	[4,5]2.43
		TEXAS										
9	07331600	Red River at Denison Dam near Denison	[2]33,720	1923-	May 21, 1935	31.80	201,000	6	44.76	144,000	4.27	[4,5]1.14
		OKLAHOMA										
10	07334000	Muddy Boggy Creek near Farris	1,087	1937-	June 17, 1945	44.94	61,900	3	42.95	75,400	69.4	[5]1.15
11	07335300	Muddy Boggy Creek near Unger	2,273	1982-	Apr. 26, 1985	44.05	28,000	5	55.06	[6]75,400	3.26	[5]1.42
		TEXAS										
12	07335500	Red River at Arthur City	[2]38,595	1905-	May 28,1908	40.08	400,000	4	34.26	290,000	7.51	[4,5]1.58
		OKLAHOMA										
13	07335790	Kiamichi River near Clayton	708	1980-	Jun. 7, 1981	20.21	24,800	4	22.23	37,000	52.3	[4]100
14	07336200	Kiamichi River near Antlers	1,138	1972-	Mar. 28, 1977	38.33	50,000	3	42.05	60,000	51.2	(1,4)
		TEXAS										
15	07336820	Red River near DeKalb	[2]41,412	1967-	Dec. 11, 1971	31.55	189,000	6	35.0	[6]250,000	6.04	(7)
		ARKANSAS										
16	07337000	Red River at Index	[2]42,094	1936-	Feb. 23, 1938	34.25	297,000	9	32.16	276,000	6.56	[5]1.45
17	07359500	Ouachita River near Malvern	1,585	1903-	May 15, 1923	30.3	140,000	20	28.88	160,000	101	100
		TEXAS										
		TRINITY RIVER BASIN										
18	08044500	West Fork Trinity River near Boyd	1,725	1947-	Oct. 14, 1981	25.87	60,400	April 26	24.05	[6]40,000	23.2	100
19	08048543	West Fork Trinity River at Beach Street, Fort Worth	2,685	1976-	Oct. 13, 1981	36.26	26,700	May 2	38.0	[6]39,100	14.6	[4]45
20	08049500	West Fork Trinity River at Grand Prairie	3,065	1925	May 17, 1949	28.00	62,000	April 28	33.4	[6]56,000	18.3	(3)
21	08050400	Elm Fork Trinity River at Gainesville	174	1985-	May 16, 1989	19.77	10,500	May 2	22.8	[6]32,000	184	(7)
22	08051130	Elm Fork Trinity River near Pilot Point	692	1985-	Oct. 21, 1985	15.75	3,290	3	27.67	[6]8,000	11.6	(7)
23	08057000	Trinity River at Dallas	6,106	1903-	May 25, 1908	52.6	184,000	3	47.08	82,000	13.4	(3)
24	08057410	Trinity River below Dallas	6,278	1908-	May 25, 1908	41.1	(7)	4	34.72	[6]86,000	13.7	(3)
					May 27, 1957	32.02	65,700					
25	08061750	East Fork Trinity River near Forney	1,118	1973-	May 17, 1989	20.96	42,700	4	22.07	[6]54,000	48.3	(7)
26	08062000	East Fork Trinity River near Crandall	1,256	1949-	May 28, 1957	22.81	33,000	5	26.03	[6]50,000	39.8	[5]1.06
27	08062500	Trinity River near Rosser	8,147	1938-	Apr. 23, 1942	41.55	150,000	4	38.10	110,000	13.5	(3,4)
28	08062700	Trinity River at Trinidad	8,538	1964-	Jun. 18, 1989	43.49	89,300	7	46.86	[6]108,000	12.6	50
29	08065000	Trinity River near Oakwood	12,833	1924-	Apr. 29, 1942	51.64	153,000	7	49.61	107,000	8.34	[8]25
30	08065350	Trinity River near Crockett	13,911	1964-	May 15, 1969	[9]52.24	78,000	10	49.54	110,000	7.91	[8]25
31	08067000	Trinity River at Liberty	17,468	1940-	May 12, 1942	29.38	114,000	23	30.03	106,000	6.07	[8]50
		BRAZOS RIVER BASIN										
32	08099100	Leon River near DeLeon	479	1960-	Jan. 21, 1968	15.50	7,540	April 26	19.0	30,000	62.6	(7)
33	08099300	Sabana River near DeLeon	264	1960-	Jun. 14, 1989	22.75	15,400	26	23.65	(7)	...	(7)
34	08100000	Leon River near Hamilton	1,891	1960-	Sept. 9,1962	31.93	18,600	May 4	33.36	25,000	13.2	(7)
		COLORADO RIVER BASIN										
35	08143500	Pecan Bayou at Brownwood	1,660	1923-	Oct. 14, 1930	16.92	31,600	April 26	17.24	35,000	21.1	[5]1.06
36	08143600	Pecan Bayou near Mullin	2,073	1967-	Jan. 23, 1968	29.26	13,700	26	43.0	40,000	19.3	[5]1.21

[1] Recurrence interval greater than 25 years but not determined.
[2] Contributing area.
[3] Recurrence interval greater than 50 years but not determined.
[4] Recurrence interval based on regulated period of record data.
[5] Recurrence interval greater than 100 years.
Value shown is approximate ratio of discharge to that of 100-year flood.
[6] Estimated.
[7] Not determined.
[8] Provided by U S Army Corps of Engineers.
[9] Site and datum then in use.

Provisional data; subject to revision

FLOOD DATA FOR SELECTED RESERVOIRS IN TEXAS, APRIL-MAY 1990

WRD Station number	Reservoir and place of determination	Drainage area (square miles)	Period of known floods	Maximum previously known			Maximum during present flood		
				Date	Stage (feet)	Contents (acre-feet)	Date	Stage (feet)	Contents (acre-feet)
	TRINITY RIVER BASIN								
08045000	Eagle Mountain Reservoir above Fort Worth	1,970	1934-	Apr. 26, 1942	659.90	333,500	May 4	657.09	....
08045400	Lake Worth above Fort Worth	2,064	1981-	Oct. 15, 1981	598.23	53,900	May 3	598.71	....
08046500	Benbrook Lake near Benbrook	429	1952-	Jun. 15, 1989	716.60	206,000	May 3	717.53	212,000
08049200	Lake Arlington at Arlington	143	1957-	May 17, 1989	562.42	60,580	4	560.23	65,900
08049800	Joe Pool Lake near Duncanville	232	1985-	Jun. 25, 1989	529.00	234,400	8	533.21	*271,300
08051100	Ray Roberts Lake near Pilot Point	692	1987-	Jul. 16, 1989	628.46	687,700	4	644.87	1,235,000
08052800	Lewisville Lake near Lewisville	1,660	1954-	Nov. 1, 1981	536.46	1,168,000	4	536.74	1,181,000
08060500	Lavon Lake near Lavon	770	1953-	Jun. 14, 1989	503.62	751,600	3	504.92	790,700
08063700	Bardwell Lake near Ennis	178	1965-	May 19, 1969	432.35	103,300	8	432.72	102,700
08066190	Livingston Reservoir, at outflow weir near Goodrich	16,583	1968-	May 23, 1983	132.88	1,948,000	21	133.02	1,960,000
	BRAZOS RIVER BASIN								
08099400	Proctor Lake near Proctor	1,259	1963-	Jun. 12, 1986	1,179.33	174,200	2	1,197.63	383,100
	COLORADO RIVER BASIN								
08143000	Lake Brownwood near Brownwood	1,565	1944-	May 2, 1956	1,431.4	192,300	April 26	1,432.65	210,000

In Oklahoma, record-breaking floods began during the first week of May. By the end of May, the five index reservoirs in the State (see table on page 15) had contents ranging from 102-123 percent of normal maximum capacity, compared with 38-164 percent at the end of April. Contents of Eufala, Keystone, and Tenkiller Ferry decreased from the end of April to the end of May despite the heavy rains.

Record-breaking floods in Arkansas during early May occurred mainly in the Arkansas River basin and along the Red River. However, rainfall of 12.97 inches in less than 24 hours, May 19-20 caused severe flooding in Hot Springs. Estimated peak discharge of the Ouachita River at Malvern (about 20 miles southeast of Hot Springs) was 160,000 cubic feet per second (cfs) which broke the previous record of 140,000 cfs set in May 1923. The peak stage of 28.88 feet was the highest since the 1923 flood when it was 30.3 feet. City officials estimated damages at $5 million not including damages to about 136 homes.

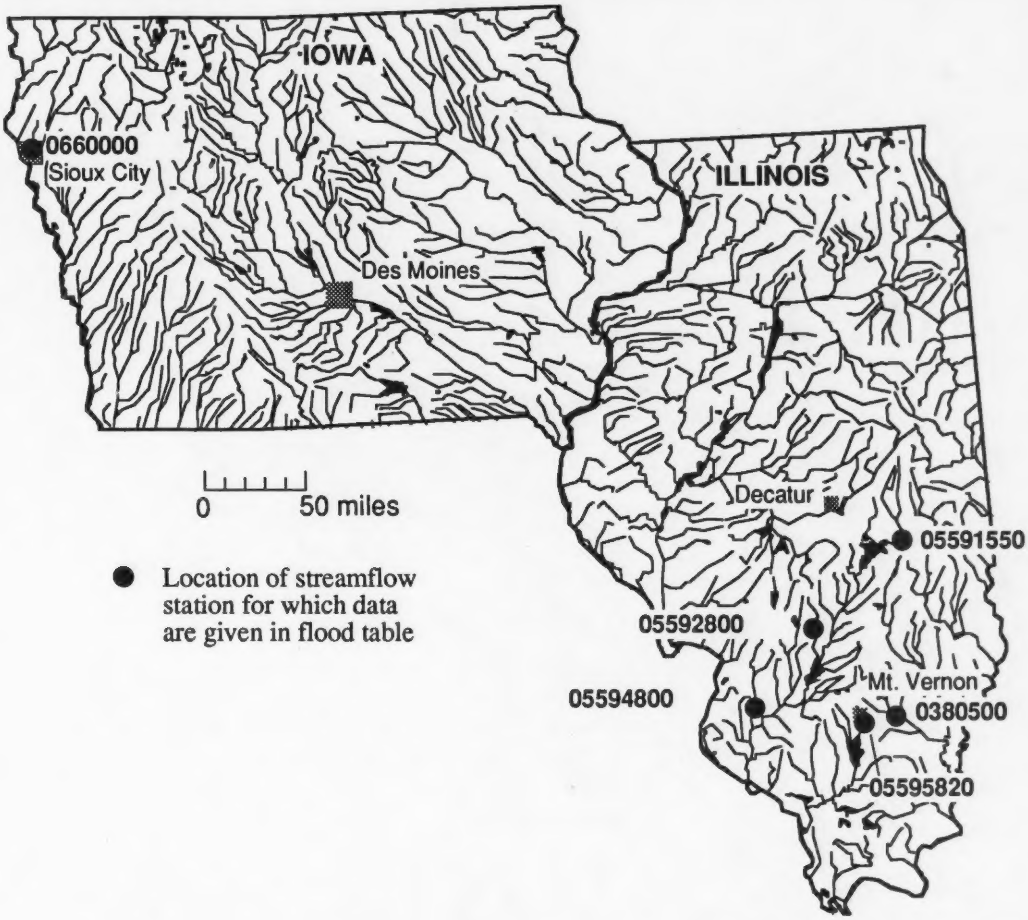
Up to 6 inches of rainfall in a 48-hour period ending May 17, falling on already saturated soil, caused severe flooding in the central and southern parts of Illinois. Preliminary data indicate that record-high discharges occurred at five gaging stations with peak discharges at two of those stations, Skillet Fork at Wayne City (76 years of record) and Whitley Creek near Allenville (9 years of record), exceeding the 100-year recurrence interval flood.

On May 20, heavy rains in Iowa caused severe flooding along Perry Creek in Sioux City. Peak discharge was estimated at 8,900 cfs. No dollar estimates of damages were available, but 17 homes were destroyed, another 256 were damaged, and 201 had minor damages. About 52 business establishments were affected by the floods, but none were destroyed. There were no deaths reported.

PRECIPITATION RANKING FOR SELECTED RIVER BASINS FOR MARCH-MAY 1990, WHERE RANK OF 1 = DRIEST, 96 = WETTEST, BASED ON THE PERIOD 1895 TO 1990. RIVER BASIN REGIONS AS DEFINED BY THE U.S. WATER RESOURCES COUNCIL. (From *Weekly Weather and Crop Bulletin* prepared and published by the NOAA/USDA Joint Agricultural Facility)

RIVER BASIN	PRECIPITATION RANK
MISSOURI BASIN	75
PACIFIC NORTHWEST BASIN	70
CALIFORNIA RIVER BASIN	43
GREAT BASIN	57
UPPER COLORADO BASIN	23
LOWER COLORADO BASIN	43
RIO GRANDE BASIN	79
ARKANSAS-WHITE-RED BASIN	94
TEXAS GULF COAST BASIN	91
SOURIS-RED-RAINY BASIN	46
UPPER MISSISSIPPI BASIN	92
LOWER MISSISSIPPI BASIN	74
GREAT LAKES BASIN	55
OHIO RIVER BASIN	66
TENNESSEE RIVER BASIN	31
NEW ENGLAND BASIN	77
MID-ATLANTIC BASIN	77
SOUTH ATLANTIC-GULF BASIN	44

FLOODS IN ILLINOIS AND IOWA DURING MAY 1990

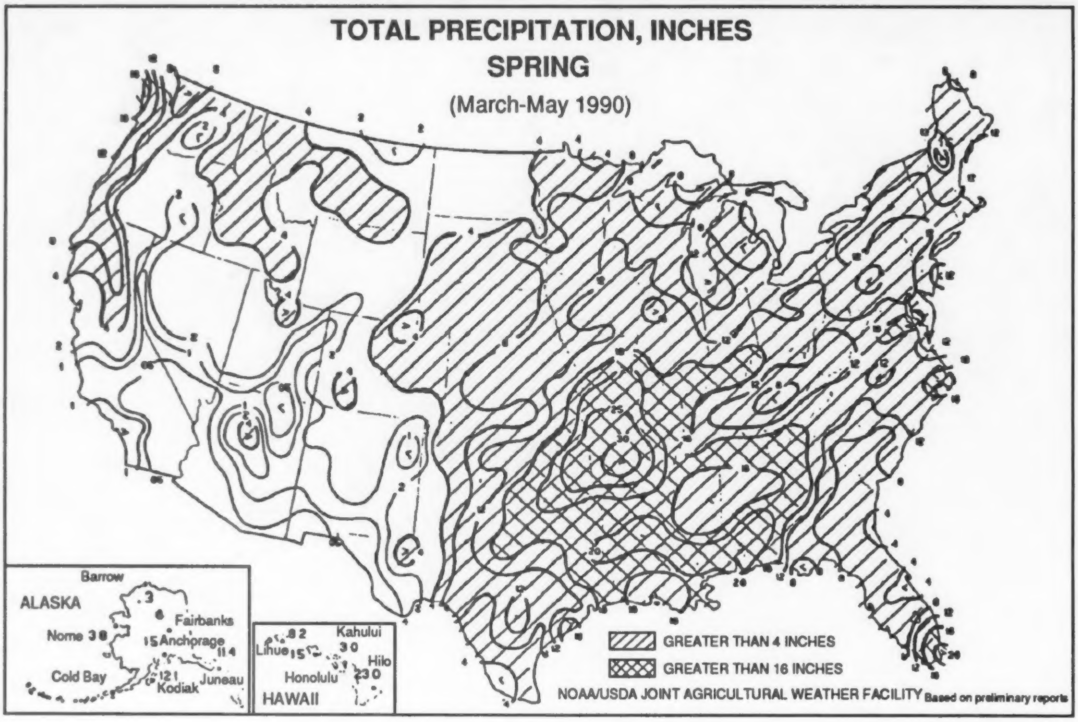


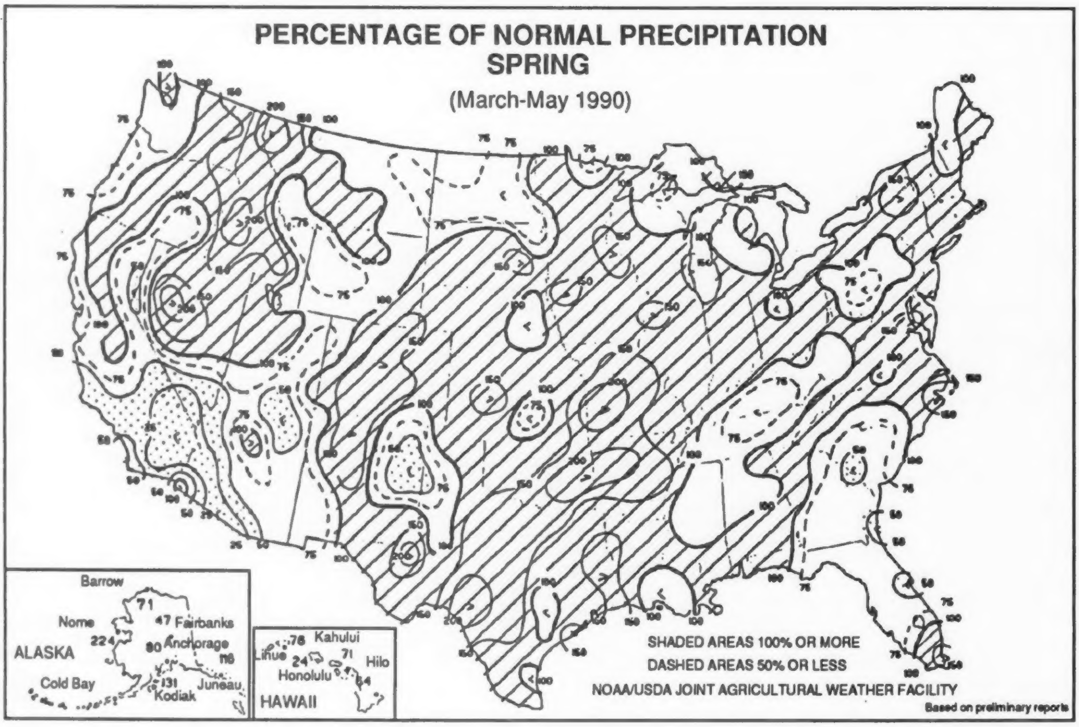
Provisional data; subject to revision

FLOOD DATA FOR SELECTED SITES IN ILLINOIS AND IOWA, MAY 1990

WRD Station number	Stream and place of determination	Drainage area (square miles)	Period of known floods	Maximum flood previously known: Date	Maximum flood previously known: Stage (feet)	Maximum flood previously known: Discharge (cfs)	Maximum during present flood: Date	Maximum during present flood: Stage (feet)	Maximum during present flood: Discharge: Cfs	Maximum during present flood: Discharge: Cfs per square mile	Maximum during present flood: Recurrence interval (years)
				ILLINOIS							
	WABASH RIVER BASIN										
03380500	Skillet Fork at Wayne City	464	1908-	May 8-9, 1961	26.68	51,000	May 17	24.15	46,900	101	[a]1.41
	KASKASKIA RIVER BASIN										
05591550	Whitley Creek near Allenville	34.6	1971-	June 1, 1980	11.77	936	16	11.61	2,150	62.1	(c)
				July 1971	[b]13.67	(c)					
05592800	Hurricane Creek near Mulberry Grove	152	1970-	Dec. 25, 1982	19.99	17,900	16	20.33	13,300	87.5	10
05594800	Silver Creek near Freeburg	464	1970-	Apr. 14, 1979	20.70	9,200	17	21.80	10,300	22.2	10
	BIG MUDDY RIVER BASIN										
05595820	Casey Fork at Mt. Vernon	76.9	1968-	Nov. 19, 1985	14.63	6,560	17	15.17	8,400	109	(c)
				IOWA							
	PERRY CREEK BASIN										
06600000	Perry Creek at 38th Street, Sioux City	65.1	1944-	Sept. 10, 1949	26.80	7,780	20	28.70	8,900	137	(c)
				July 7, 1944	[b]30.50	[b]9,600					

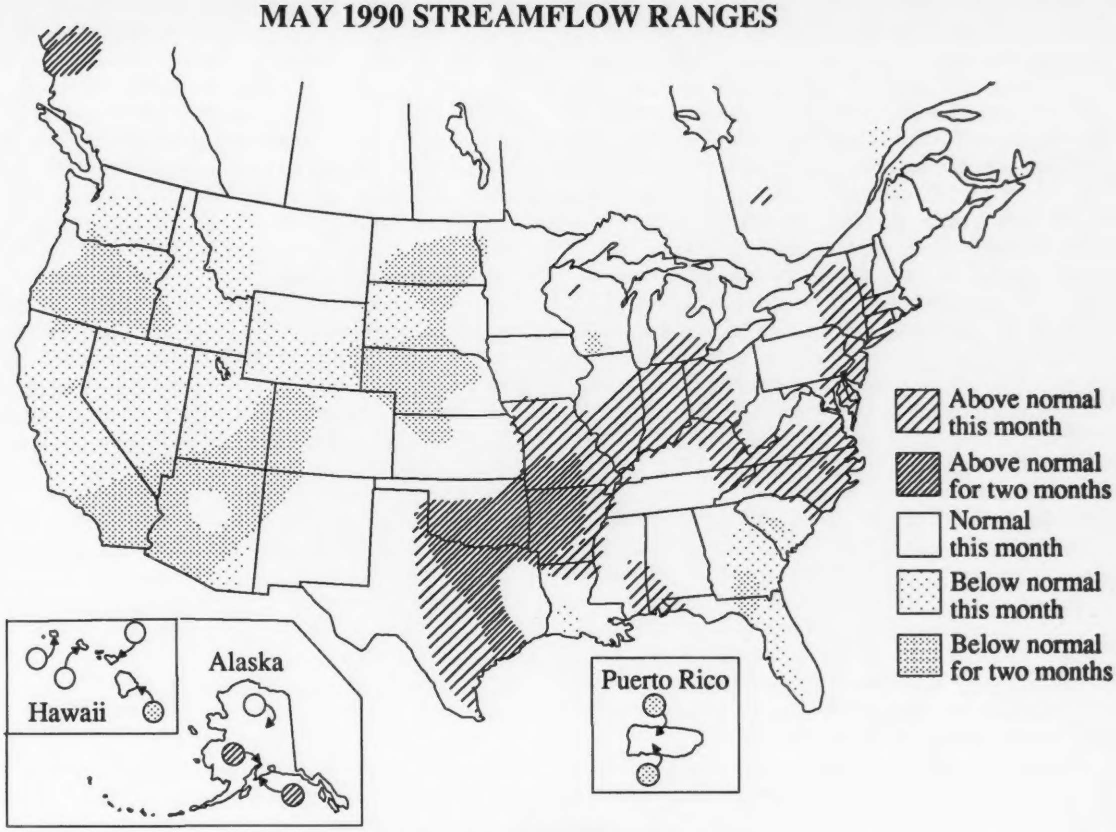
[a] Recurrence interval greater than 100 years. Value shown is approximate ratio of discharge to that of 100-year flood.
[b] From U.S. Army Corps of Engineers .
[c] Not determined.



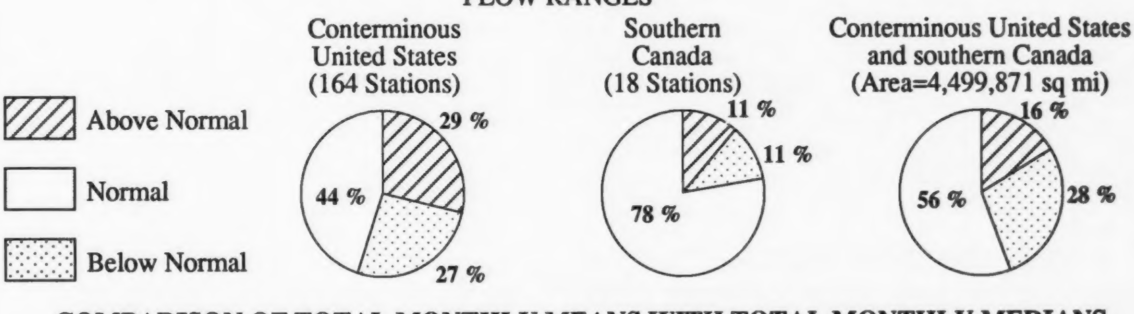


(From *Weekly Weather and Crop Bulletin* prepared and published by the NOAA/USDA Joint Agricultural Facility)

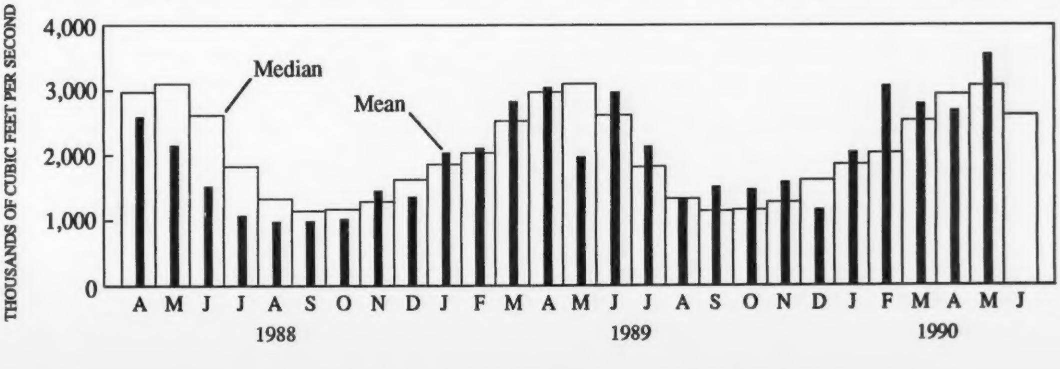
MAY 1990 STREAMFLOW RANGES



SUMMARY OF MAY 1990 STREAMFLOW FLOW RANGES



COMPARISON OF TOTAL MONTHLY MEANS WITH TOTAL MONTHLY MEDIANS



the below-average range and significantly lower than last year (with normal maximum contents of at least 1,000,000 acre-feet) were: International Amistad, International Falcon, and Lake Travis, Texas; Lake McConaughy, Nebraska; Fort Peck, Montana; Boise River and associated reservoirs, Idaho; the Pathfinder and associated reservoirs, Wyoming; Colorado-Big Thompson Project, Colorado; Bear Lake, Idaho-Utah; and also Folsom Lake, Clair Engle Lake, Lake Berryessa and Shasta Lake, California. Lake Tahoe (California-Nevada) had 11 percent usable storage at the end of the month compared with 9 percent at the end of last month (which ended four months of no usable storage), while San Carlos (Arizona) had only 3 percent of normal maximum contents, a decline from two consecutive months of storage at 5 percent. Graphs of contents for seven reservoirs are shown on page 14 with contents for the 100 reporting reservoirs given on page 15.

Streamflow conditions during May 1990 and May 1989 are shown by maps on page 16. There is about twice as much area in the below-normal range during May 1990 as there was during May 1989. Total area in the above-normal range during May 1990 is about 20 percent more than during May 1989. Parts of the Gulf Coast States, Great Lakes States, and Atlantic Coast States have streamflow in the above-normal range during both months. In the West, large areas have below-normal range streamflow during both months. The locations of reservoirs with below-average contents at the end of May 1990 and May 1989 are also shown on the respective maps.

Mean May elevations at the four master gages on the Great Lakes (provisional National Ocean Service data) were in the below-normal range on Lake Superior and Lake Huron, and in the normal range on Lake Erie and Lake Ontario. Levels rose from those for April on all four lakes. May 1990 levels ranged from 0.13 foot (Lake Huron) to 0.40 foot higher (Lake Ontario) than those for April. Monthly means have now been in the below-normal range for 8 months on Lake Superior and 1 month on Lake Huron (after 2 months in the normal range). Monthly means have been in the normal range for 26 months on Lake Erie and 13 months on Lake Ontario. May 1990 levels ranged from 0.38 foot higher (Lake Ontario) to 0.69 foot lower (Lake Superior) than those for May 1989. Stage hydrographs for the master gages on Lake Superior, Lake Huron, Lake Erie, and Lake Ontario are on page 17.

Utah's Great Salt Lake (graph on page 17) fell 0.40 foot to 4,204.30 feet above National Geodetic Vertical Datum (NGVD) of 1929 during the month. Lake level declined seasonally after remaining at 4,204.70 feet above NGVD of 1929 through much of March and April. Lake level is 2.30 feet lower than at the end of May 1989, and 7.55 feet lower than the maximum of record which occurred in June 1986 and March-April 1987.

The Palmer Drought Severity maps for May 12 and 26, 1990 (page 20), show an increase in size of the area of extreme drought west of the Mississippi River outside of the Dakotas. The area of severe and extreme drought in southern Florida remains about the same size. The area of serious drought in northeastern Wisconsin and the upper peninsula of Michigan went to moderate by May 26.

Precipitation in the United States during April 1990 (provisional National Weather Service maps on page 21) was above-normal over most of the Nation. Large areas of well-below-normal (50 percent or less) precipitation occurred in parts of the Colorado River basin, Rio Grande basin, upper Missouri River basin, Hudson Bay-upper Mississippi River-western St. Lawrence River basins, and also in a contiguous area including parts of South Carolina, Georgia, and Florida.

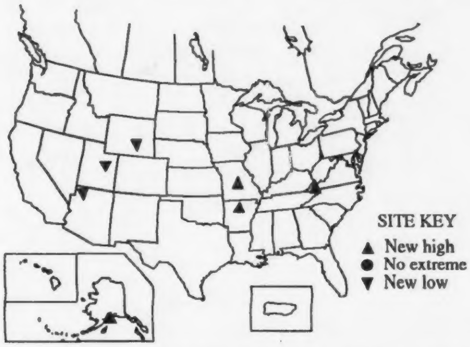
Provisional data; subject to revision

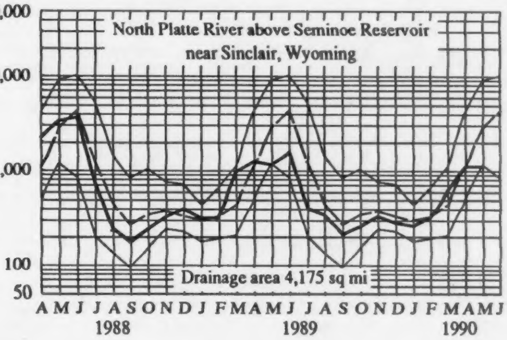
NEW EXTREMES DURING MAY 1990 AT STREAMFLOW INDEX STATIONS

			Previous May extremes (period of record)			May 1990			
Station number	Stream and place of determination	Drainage area (square miles)	Years of record	Monthly mean in cfs (year)	Daily mean in cfs (year)	Monthly mean in cfs	Percent of median	Daily mean in cfs	Day
			LOW FLOWS						
06630000	North Platte River above Seminoe Reservoir near Sinclair, Wyoming	4,175	50	1,166 (1989)	505 (1981)	1,136	40	722	6
09315000	Green River at Green River, Utah	44,850	90	4,632 (1934)	2,040 (1963)	4,101	35	3,330	8
09415000	Virgin River at Littlefield, Arizona	5,090	60	47.3 (1989)	38.0 (1989)	44.3	29	42.0	9
			HIGH FLOWS						
03488000	North Fork Holston River near Saltville, Virginia	222	70	839 (1958)	5,660 (1984)	856	248	2,720	29
06933500	Gasconade River at Jerome, Missouri	2,840	69	15,360 (1943)	72,300 (1983)	16,089	530	45,000	27
07056000	Buffalo River near St. Joe, Arkansas	829	50	6,374 (1961)	51,700 (1943)	7,018	532	65,600	3
15258000	Kenai River at Cooper Landing, Alaska	634	42	3,360 (1981)	7,150 (1960)	3,388	202	5,000	31

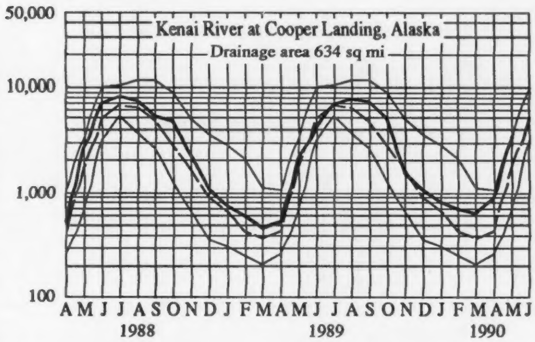
MONTHLY MEAN DISCHARGE OF SELECTED STREAMS

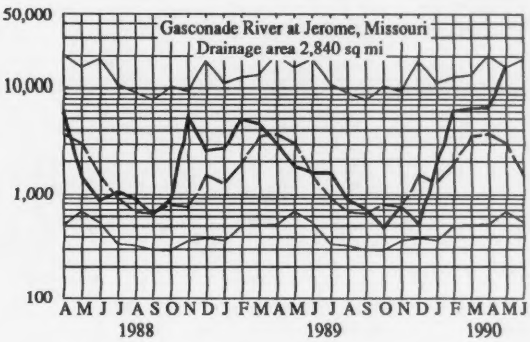
Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period.

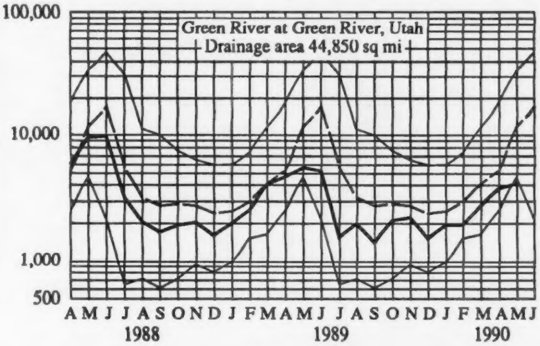


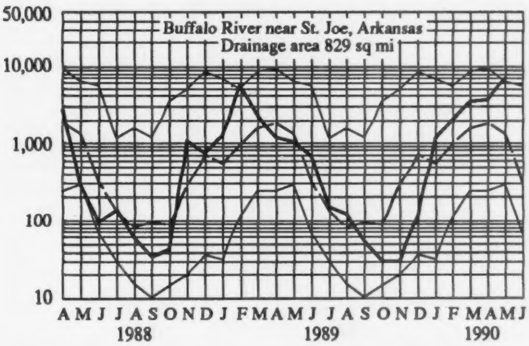


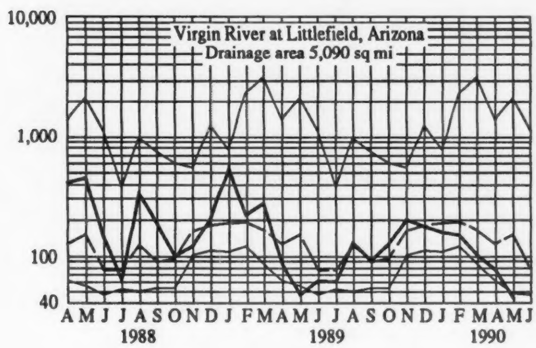
DISCHARGE IN CUBIC FEET PER SECOND

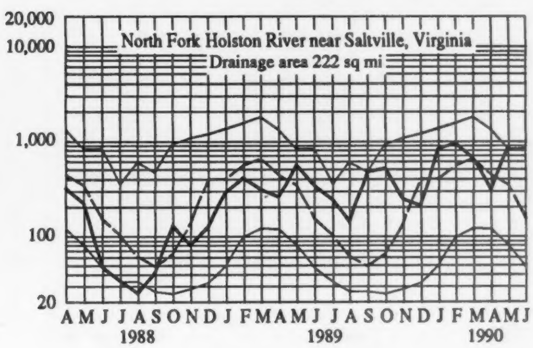






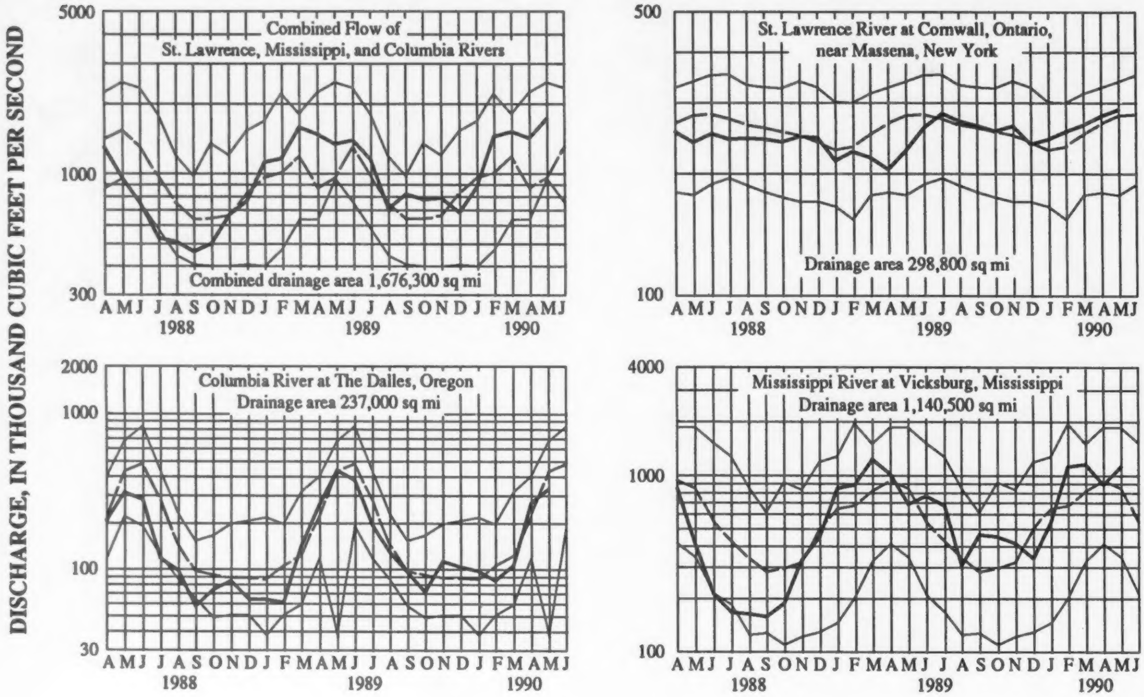






HYDROGRAPHS FOR THE "BIG THREE" RIVERS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period.



Provisional data; subject to revision

DISSOLVED SOLIDS AND WATER TEMPERATURES, FOR MAY 1990, AT DOWNSTREAM SITES ON FIVE LARGE RIVERS

Station number	Station name	May data of following calendar years	Stream discharge during month Mean (cfs)	Dissolved-solids concentration[a] Minimum (mg/L)	Dissolved-solids concentration[a] Maximum (mg/L)	Dissolved-solids discharge[a] Mean (tons per day)	Dissolved-solids discharge[a] Minimum (tons per day)	Dissolved-solids discharge[a] Maximum (tons per day)	Water temperature[b] Mean in °C	Water temperature[b] Minimum in °C	Water temperature[b] Maximum in °C
01463500	Delaware River at Trenton,	1990	22,000	71	110	4,920	1,910	9,470	15.5	13.5	19.0
	New Jersey, (Morrisville,	1945-89	15,500	50	123	3,820	930	21,800	17.0	10.0	28.5
	Pennsylvania)	(Extreme yr)		(1946)	(1978)		(1965)	(1984)			
			[c]12,650								
07289000	Mississippi River at	1990	1,120,000	188	219	605,000	499,000	776,000	19.5	18.0	22.0
	Vicksburg, Mississippi	1976-89	798,000	178	295	470,000	176,000	954,000	20.5	14.5	27.0
		(Extreme yr)		(1977)	(1987)		(1977)	(1983)			
			[c]838,200								
03612500	Ohio River at lock and dam 53,	1990	434,000	129	209	......	96,800	290,000	...	15.5	17.5
	near Grand Chain, Illinois,	1955-89	349,000	124	287	......	25,500	466,000	...	6.5	25.0
	(streamflow station at Metropolis,	(Extreme yr)		(1983)	(1979)		(1976)	(1984)			
	Illinois)		[c]296,000								
06934500	Missouri River at Hermann,	1990	195,000	177	349	135,000	65,300	276,000	17.0	15.0	20.0
	Missouri. (60 miles west of	1976-89	117,000	211	520	111,000	41,400	272,000	19.0	13.0	24.5
	St. Louis, Missouri)	(Extreme yr)		(1978)	(1981)		(1989)	(1983)			
			[c]92,040								
14128910	Columbia River at Warrendale,	1990	216,000	76	87	46,700	33,300	56,800	13.0	11.5	15.0
	Oregon (streamflow station at	1976-89	255,000	67	144	65,500	37,500	102,000	12.5	9.5	16.5
	The Dalles, Oregon)	(Extreme yr)		(1976)	(1977)		(1977)	(1983)			
			[c]427,700								

[a]Dissolved -solids concentrations, when not analyzed directly, are calculated on basis of measurements of specific conductance.
[b]To convert °C to °F: [(1.8 x °C) + 32] = °F.
[c]Median of monthly values for 30-year reference period, water years 1951-80, for comparison with data for current month.

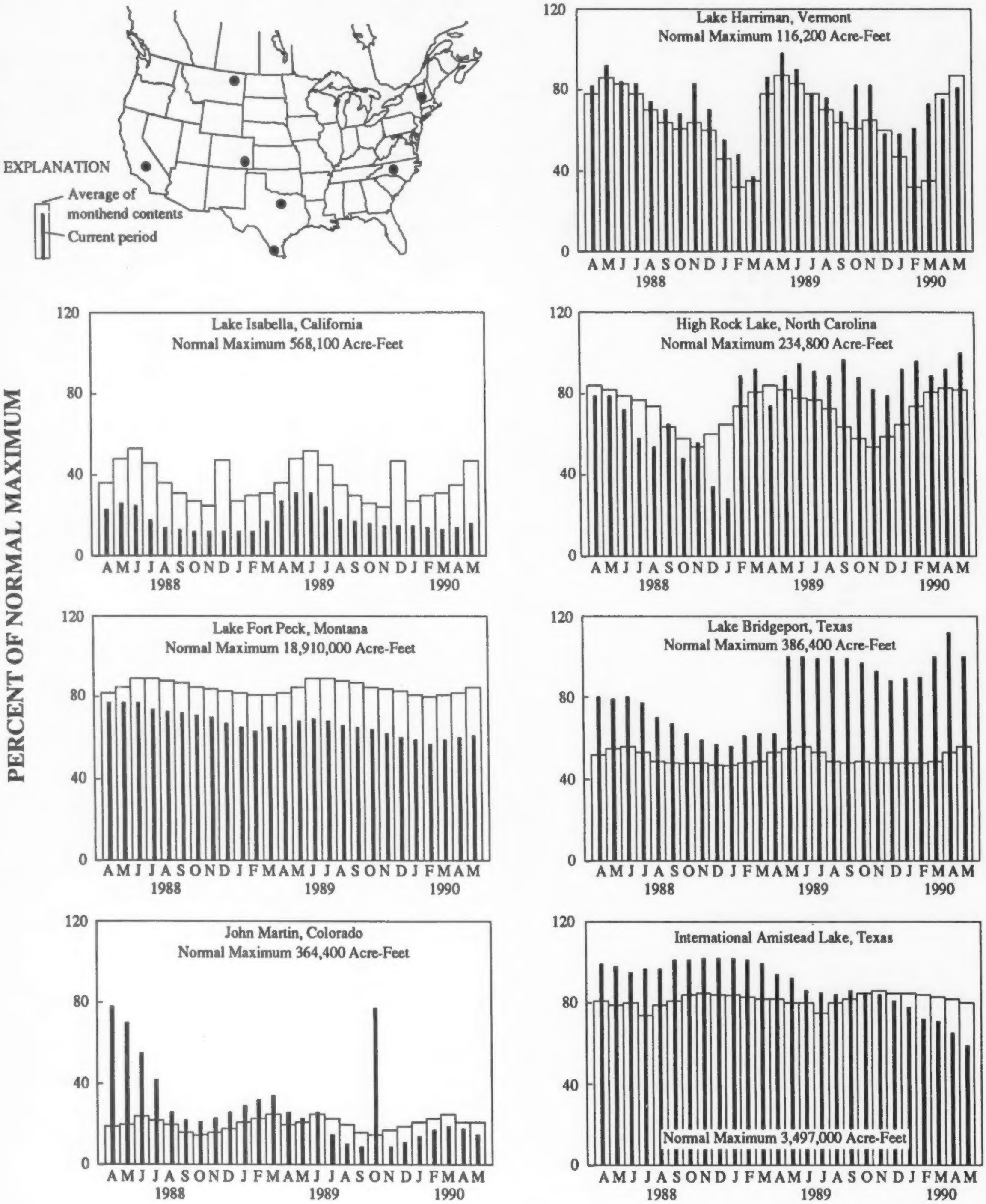
Provisional data; subject to revision

FLOW OF LARGE RIVERS DURING MAY 1990

Station number	Stream and place of determination	Drainage area (square miles)	Average discharge through September 1985 (cubic feet per second)	May 1990: Monthly mean discharge (cubic feet per second)	Percent of median monthly discharge 1951–80	Change in discharge from previous month (percent)	Discharge near end of month: Cubic feet per second	Discharge near end of month: Million gallons per day	Date
01014000	St. John River below Fish River at Fort Kent, Maine ...	5,665	9,758	23,200	69	−20	11,000	7,100	31
01318500	Hudson River at Hadley, New York	1,664	2,908	8,040	161	−8	5,200	3,360	31
01357500	Mohawk River at Cohoes, New York	3,456	5,683	13,600	203	14	4,500	2,910	31
01463500	Delaware River at Trenton, New Jersey	6,780	11,670	22,000	174	47	29,500	19,100	31
01570500	Susquehanna River at Harrisburg, Pennsylvania	24,100	34,340	48,400	115	5	37,600	24,300	28
01646500	Potomac River near Washington, District of Columbia...	11,560	[1]11,500	[1]13,100	94	2	48,600	31,400	31
02105500	Cape Fear River at William O. Huske Lock, near Tarheel, North Carolina.	4,852	5,002	6,080	181	−16	......	......	...
02131000	Pee Dee River at Peedee, South Carolina	8,830	9,871	12,200	161	−11	20,200	13,100	31
02226000	Altamaha River at Doctortown, Georgia	13,600	13,730	6,400	53	−69	4,960	3,200	31
02320500	Suwannee River at Branford, Florida	7,880	6,986	3,300	50	−48	2,650	1,700	31
02358000	Apalachicola River at Chattahoochee, Florida	17,200	22,420	17,100	85	−38	17,500	11,300	31
02467000	Tombigbee River at Demopolis lock and dam, near Coatopa, Alabama.	15,385	23,520	20,200	91	1	22,800	14,700	31
02489500	Pearl River near Bogalusa, Louisiana	6,573	9,880	17,100	166	85	6,740	4,360	31
03049500	Allegheny River at Natrona, Pennsylvania	11,410	[1]19,580	[1]27,600	130	−6	20,200	13,100	28
03085000	Monongahela River at Braddock, Pennsylvania	7,337	[1]12,480	[1]16,600	118	5	48,600	31,400	28
03193000	Kanawha River at Kanawha Falls, West Virginia	8,367	12,550	16,200	126	11	28,200	18,200	29
03234500	Scioto River at Higby, Ohio	5,131	4,583	16,300	345	174	29,900	19,300	31
03294500	Ohio River at Louisville, Kentucky[2]	91,170	115,800	231,000	175	29	413,000	267,000	31
03377500	Wabash River at Mount Carmel, Illinois	28,635	27,660	93,000	291	119	69,600	45,000	31
03469000	French Broad River below Douglas Dam, Tennessee	4,543	[1]6,739	9,160	136	27	......	......	...
04084500	Fox River at Rapide Croche Dam, near Wrightstown, Wisconsin.[2]	6,010	4,238	6,160	108	116	7,640	4,940	30
04264331	St. Lawrence River at Cornwall, Ontario, near Massena, New York.[3]	298,800	243,900	288,000	103	4	293,000	189,000	31
02NG001	St. Maurice River at Grand Mere, Quebec	16,300	24,910	63,300	92	156	14,000	9,000	31
05082500	Red River of the North at Grand Forks, North Dakota...	30,100	2,593	1,420	38	−39	1,350	872	31
05133500	Rainy River at Manitou Rapids, Minnesota	19,400	12,920	20,500	113	156	26,300	17,000	29
05330000	Minnesota River near Jordan, Minnesota	16,200	3,680	2,840	52	185	4,750	3,100	31
05331000	Mississippi River at St. Paul, Minnesota	36,800	[1]11,020	13,500	61	66	14,800	9,570	31
05365500	Chippewa River at Chippewa Falls, Wisconsin	5,650	5,149	8,440	139	151	5,500	3,550	31
05407000	Wisconsin River at Muscoda, Wisconsin	10,400	8,710	11,700	105	96	10,000	6,000	31
05446500	Rock River near Joslin, Illinois	9,549	6,080	8,080	119	14	7,630	4,930	31
05474500	Mississippi River at Keokuk, Iowa	119,000	63,790	101,000	104	106	120,000	78,000	31
06214500	Yellowstone River at Billings, Montana	11,795	7,056	10,000	75	46	21,500	13,900	31
06934500	Missouri River at Hermann, Missouri	524,200	80,880	196,000	212	122	201,000	130,000	31
07289000	Mississippi River at Vicksburg, Mississippi[4]	1,140,500	584,000	1,117,000	133	27	......	......	...
07331000	Washita River near Dickson, Oklahoma	7,202	1,402	15,900	916	1	4,650	3,000	31
08276500	Rio Grande below Taos Junction Bridge, near Taos, New Mexico.	9,730	742	894	101	99	640	413	31
09315000	Green River at Green River, Utah	44,850	6,391	4,100	35	10	......	......	...
11425500	Sacramento River at Verona, California	21,251	19,430	9,680	55	−36	......	......	...
13269000	Snake River at Weiser, Idaho	69,200	18,520	11,100	43	−3	18,100	11,700	31
13317000	Salmon River at White Bird, Idaho	13,550	11,390	16,600	52	18	33,000	21,300	31
13342500	Clearwater River at Spalding, Idaho	9,570	15,510	35,000	69	−5	65,900	42,600	31
14105700	Columbia River at The Dalles, Oregon[5]	237,000	[1]193,500	[1]331,000	77	24	278,000	178,000	31
14191000	Willamette River at Salem, Oregon	7,280	[1]23,690	[1]18,500	79	−4	14,700	9,500	31
15515500	Tanana River at Nenana, Alaska	25,600	23,810	33,500	113	98	33,500	21,700	31
08MF005	Fraser River at Hope, British Columbia	83,800	96,250	177,000	98	67	259,000	167,000	31

[1]Adjusted.
[2]Records furnished by Corps of Engineers.
[3]Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y., when adjusted for storage in Lake St. Lawrence.
[4]Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[5]Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS



Provisional data; subject to revision

USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF MAY 1990

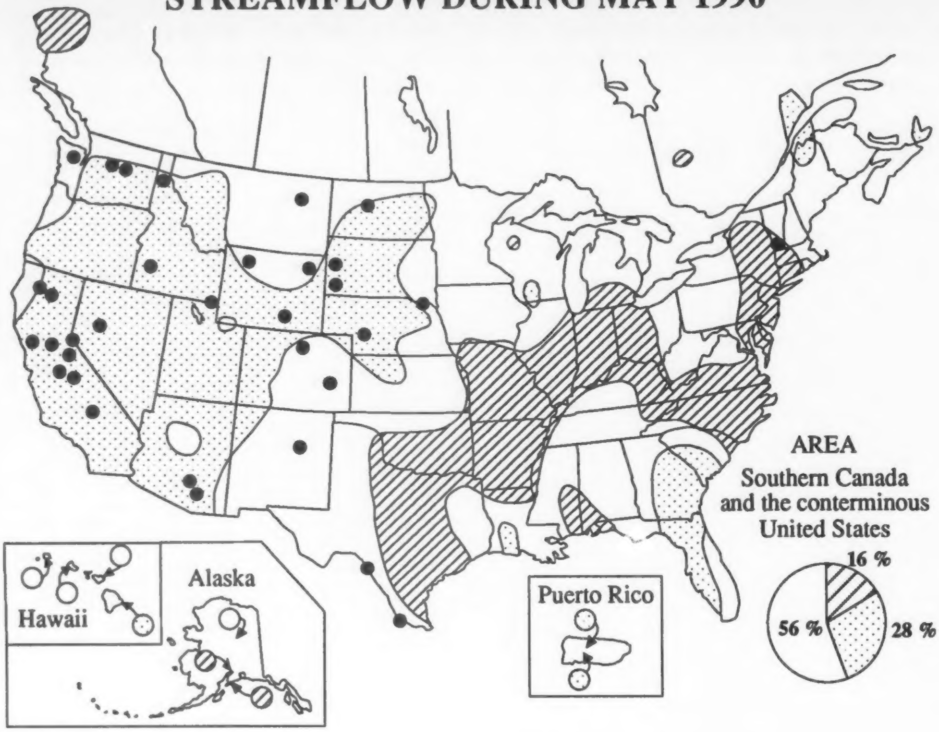
[Contents are expressed in percent of reservoir (system) capacity. The usable storage capacity of each reservoir (system) is shown in the column headed "Normal maximum"]

Reservoir Principal uses: F-Flood control I-Irrigation M-Municipal P-Power R-Recreation W-Industrial	Percent of normal maximum: End of May 1990	Percent of normal maximum: End of May 1989	Percent of normal maximum: Average for end of May	Percent of normal maximum: End of April 1990	Normal maximum (acre-feet)[a]
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	83	75	78	81	[b]226,300
QUEBEC					
Allard (P)	90	89	88	90	280,600
Gouin (P)	60	60	65	46	6,954,000
MAINE					
Seven Reservoir Systems (MP)	96	92	89	88	4,107,000
NEW HAMPSHIRE					
First Connecticut Lake (P)	87	93	87	68	76,450
Lake Francis (FPR)	94	98	82	85	99,310
Lake Winnipesaukee (PR)	108	105	101	91	165,700
VERMONT					
Harriman (P)	81	98	87	75	116,200
Somerset (P)	94	95	86	84	57,390
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	95	95	89	93	77,920
NEW YORK					
Great Sacandaga Lake (FPR)	101	100	97	100	786,700
Indian Lake (FMP)	99	100	102	94	103,300
New York City Reservoir System (MW)	100	96	100	100	1,680,000
NEW JERSEY					
Wanaque (M)	100	100	94	99	77,450
PENNSYLVANIA					
Allegheny (FPR)	49	49	47	49	1,180,000
Pymatuning (FMR)	99	104	99	98	188,000
Raystown Lake (FR)	68	68	62	68	761,900
Lake Wallenpaupack (PR)	88	85	79	77	157,800
MARYLAND					
Baltimore Municipal System (M)	99	97	94	93	261,900
NORTH CAROLINA					
Bridgewater (Lake James) (P)	93	95	92	90	288,800
Narrows (Badin Lake) (P)	100	93	98	95	128,900
High Rock Lake (P)	100	89	82	92	234,800
SOUTH CAROLINA					
Lake Murray (P)	91	91	84	88	1,614,000
Lakes Marion and Moultrie (P)	84	82	79	85	1,862,000
SOUTH CAROLINA-GEORGIA					
Strom Thurmond Lake (FP)	77	55	74	85	1,730,000
GEORGIA					
Burton (PR)	98	98	94	99	104,000
Sinclair (MPR)	88	87	92	86	214,000
Lake Sidney Lanier (FMPR)	65	54	64	66	1,686,000
ALABAMA					
Lake Martin (P)	97	98	94	98	1,375,000
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	79	77	65	67	2,293,000
Douglas Lake (FPR)	85	83	71	65	1,395,000
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	89	92	82	86	1,012,000
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	86	86	70	75	2,880,000
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	81	95	82	81	1,478,000
WISCONSIN					
Chippewa and Flambeau (PR)	93	98	86	93	365,000
Wisconsin River (21 Reservoirs) (PR)	82	78	81	67	399,000
MINNESOTA					
Mississippi River Headwater System (FMR)	44	44	37	41	1,640,000
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	58	64	84	58	22,700,000
SOUTH DAKOTA					
Angostura (I)	56	52	86	53	130,770
Belle Fourche (I)	61	70	74	50	185,200
Lake Francis Case (FIP)	83	82	86	79	4,589,000
Lake Oahe (FIP)	61	64	...	62	22,240,000
Lake Sharpe (FIP)	101	101	101	103	1,697,000
Lewis and Clark Lake (FIP)	80	82	92	81	432,000
NEBRASKA					
Lake McConaughy (IP)	70	78	80	70	1,948,000
OKLAHOMA					
Eufaula (FPR)	122	100	98	164	2,378,000
Keystone (FPR)	110	91	107	116	661,000
Tenkiller Ferry (FPR)	123	105	103	136	628,200
Lake Altus (FIMR)	102	99	67	38	133,000
Lake O'The Cherokees (FPR)	112	92	93	108	1,492,000
OKLAHOMA-TEXAS					
Lake Texoma (FMPRW)	155	101	102	181	2,722,000
TEXAS					
Bridgeport (IMW)	100	100	56	112	386,400
Canyon (FMR)	100	96	83	87	385,600
International Amistad (FIMPW)	59	92	80	65	3,497,000
International Falcon (FIMPW)	48	72	64	51	2,668,000
Livingston (IMW)	104	101	93	101	1,788,000
Possum Kingdom (IMPRW)	94	85	96	98	570,200
Red Bluff (P)	25	48	28	28	307,000
Toledo Bend (P)	103	101	93	96	4,472,000
Twin Buttes (FIM)	48	71	35	47	177,800
Lake Kemp (IMW)	98	84	89	123	268,000
Lake Meredith (FMW)	37	40	35	44	796,900
Lake Travis (FIMPRW)	97	82	83	68	1,144,000
MONTANA					
Canyon Ferry (FIMPR)	75	71	79	70	2,043,000
Fort Peck (FPR)	61	68	85	60	18,910,000
Hungry Horse (FIPR)	81	66	72	66	3,451,000
WASHINGTON					
Ross (PR)	55	58	58	35	1,052,000
Franklin D. Roosevelt Lake (IP)	59	40	72	62	5,022,000
Lake Chelan (PR)	64	62	73	52	676,100
Lake Cushman (PR)	29	83	95	28	359,500
Lake Merwin (P)	106	106	103	103	245,600
IDAHO					
Boise River (4 Reservoirs) (FIP)	65	79	80	62	1,235,000
Coeur d'Alene Lake (P)	114	94	123	115	238,500
Pend Oreille Lake (FP)	76	78	80	62	1,561,000
IDAHO-WYOMING					
Upper Snake River (8 Reservoirs) (MP)	78	81	78	63	4,401,000
WYOMING					
Boysen (FIP)	67	60	66	69	802,000
Buffalo Bill (IP)	48	60	73	58	421,300
Keyhole (F)	27	31	48	26	193,800
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	46	58	62	43	3,056,000
COLORADO					
John Martin (FIR)	15	23	21	18	364,400
Taylor Park (IR)	70	73	70	63	106,200
Colorado-Big Thompson Project (I)	43	64	64	38	730,300
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa Reservoirs (IFPR)	71	84	...	71	31,620,000
UTAH-IDAHO					
Bear Lake (IPR)	51	64	70	53	1,421,000
CALIFORNIA					
Folsom (FIP)	53	94	86	50	1,000,000
Hetch Hetchy (MP)	61	91	70	36	360,400
Isabella (FIR)	16	31	47	14	568,100
Pine Flat (FI)	32	37	71	14	1,001,000
Clair Engle Lake (Lewiston) (P)	62	77	90	58	2,438,000
Lake Almanor (P)	82	90	67	79	1,036,000
Lake Berryessa (FIMW)	48	61	86	51	1,600,000
Millerton Lake (FI)	68	75	77	55	503,200
Shasta Lake (FIPR)	51	80	90	59	4,377,000
CALIFORNIA-NEVADA					
Lake Tahoe (IPR)	11	25	67	9	744,600
NEVADA					
Rye Patch (I)	8	33	68	19	194,300
ARIZONA-NEVADA					
Lake Mead and Lake Mohave (FIMP)	79	84	72	83	27,970,000
ARIZONA					
San Carlos (IP)	3	32	29	5	935,100
Salt and Verde River System (IMPR)	47	73	55	49	2,019,100
NEW MEXICO					
Conchas (FIR)	61	69	83	66	315,700
Elephant Butte and Caballo (FIPR)	71	85	43	74	2,233,300

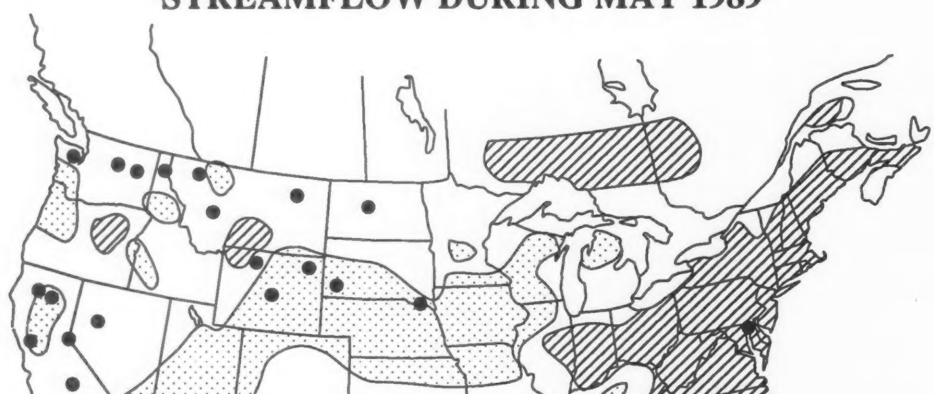
[a]1 acre-foot = 0.04356 million cubic feet = 0.326 million gallons = 0.504 cubic feet per second per day.

[b]Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).

STREAMFLOW DURING MAY 1990



STREAMFLOW DURING MAY 1989



Above-normal range

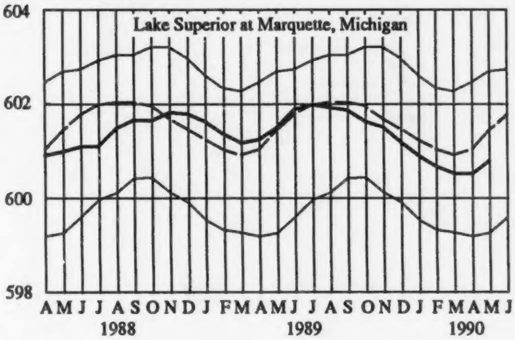
Below-normal range

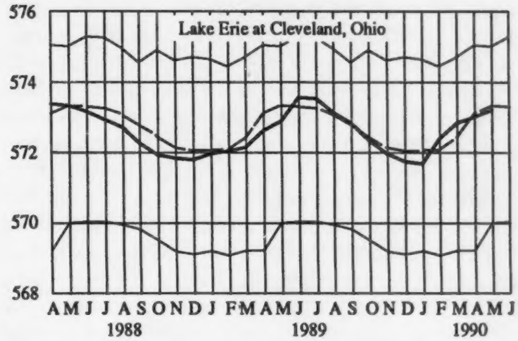
● Below-average reservoir storage

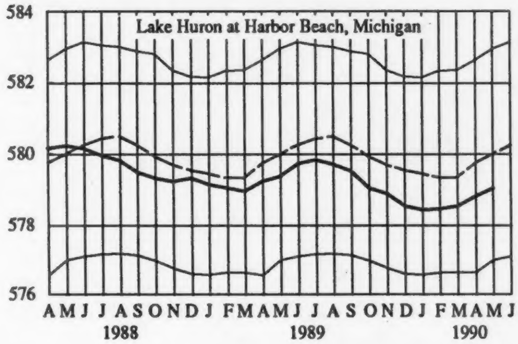
GREAT LAKES ELEVATIONS

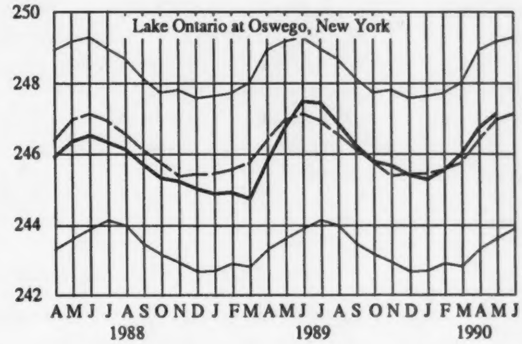
Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period. Data from National Ocean Service.

ELEVATION, IN FEET ABOVE NATIONAL GEODETIC VERTICAL DATUM OF 1929

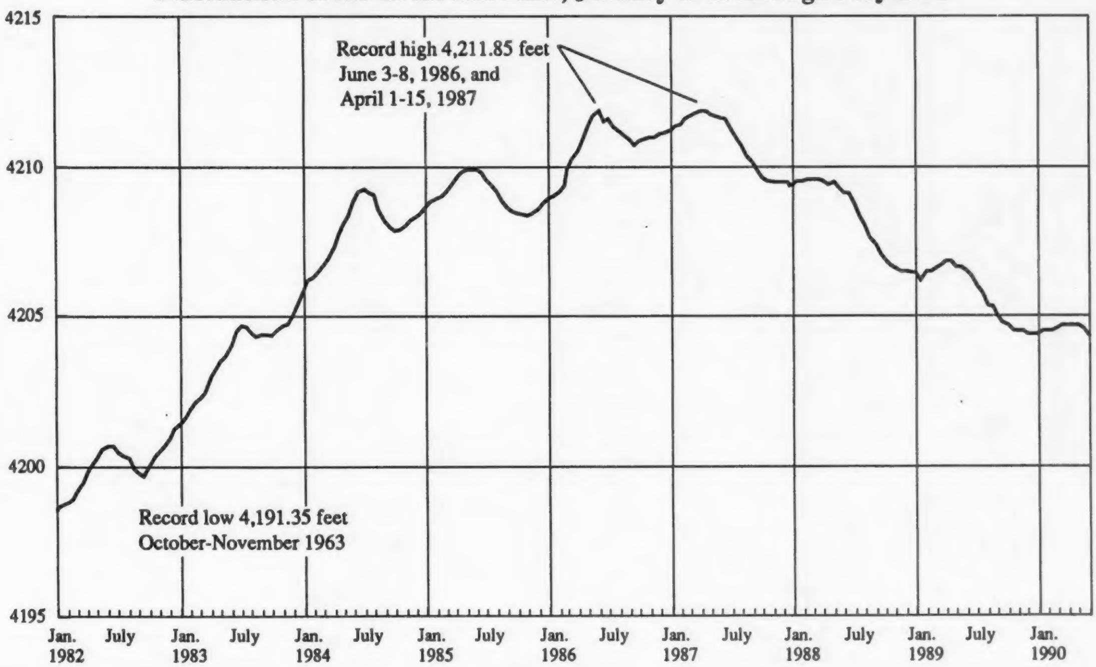








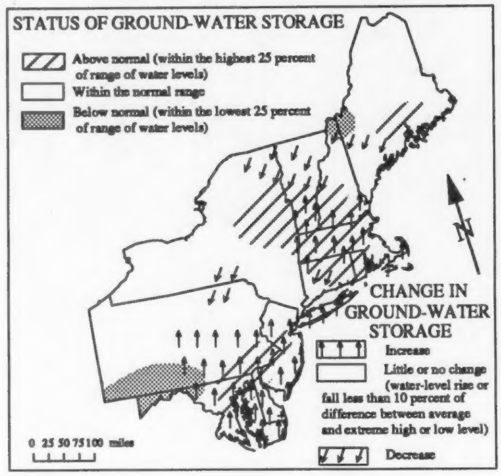
Fluctuations of the Great Salt Lake, January 1982 through May 1990



GROUND-WATER CONDITIONS DURING MAY 1990

Ground-water levels rose in the southeastern part of the Northeast region and in much of central New England. (See map.) Levels declined in scattered areas including parts of Maine, New Hampshire, Vermont, New York, and Connecticut. Above-average levels generally occurred where water levels rose during the month and also in part of southern Maine. Levels remained below average in the southwestern corner of the region and in a small area in northern New Hampshire and adjacent Maine. A May high occurred in a key well near Granby, Hampshire County, Massachusetts.

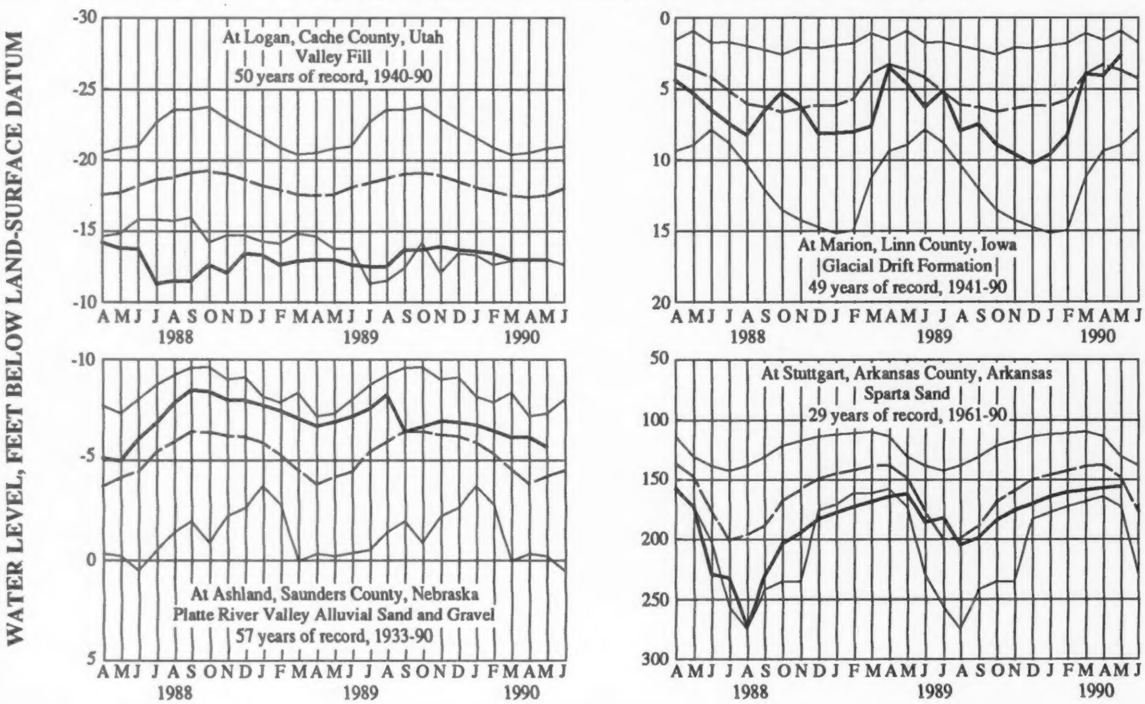
In the Southeastern States, ground-water levels rose in Kentucky and most of North Carolina, and declined in most of West Virginia, Louisiana, and Georgia. Elsewhere levels showed mixed changes since last month. Levels were above long-term averages in most of West Virginia, Kentucky, Virginia, North Carolina, and much of Georgia, and below average in Arkansas, Louisiana, and Florida. Record May highs occurred at key wells in Viola, Graves County, Kentucky, and Thelma, Louisa County, Virginia. Level rose to an all-time high in the well at Glenville, Gilmer County, West Virginia; and fell to an all-time low in the well at Ruston, Jackson County, Louisiana.



Map showing ground-water storage near end of May and change in ground-water storage from end of April to end of May.

MONTHEND GROUND-WATER LEVELS IN KEY WELLS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates average of monthly levels in previous years. Heavy line indicates level for current period.



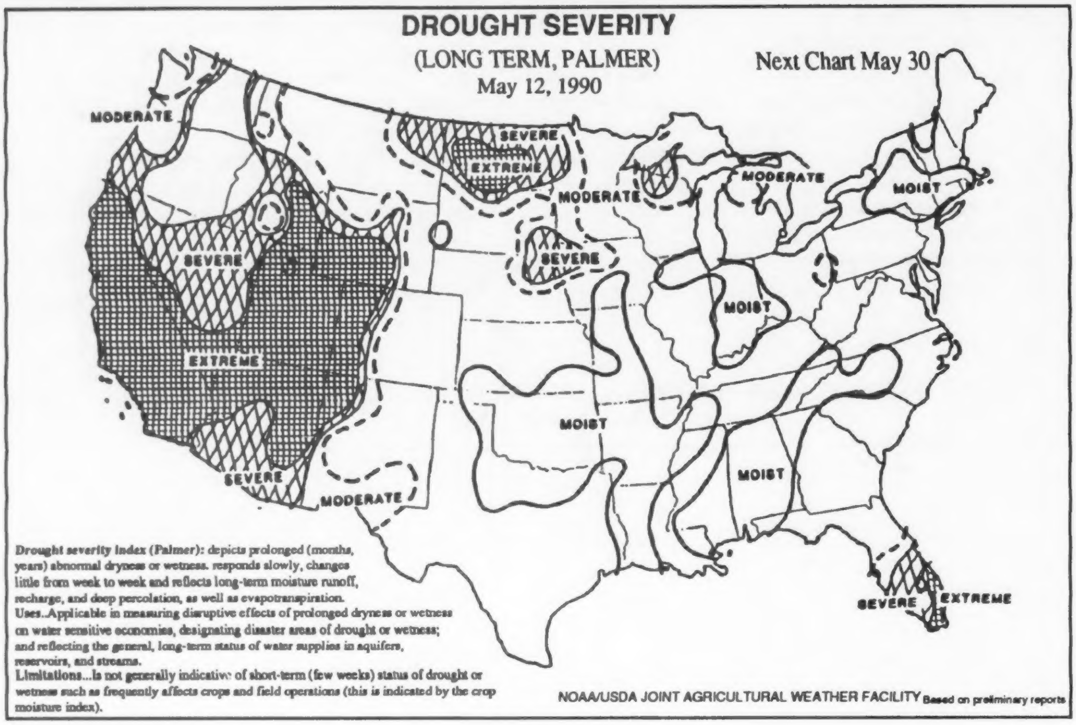
Ground-water levels rose in key wells in most of the central and western Great Lakes States including Minnesota, Wisconsin, most of Michigan, Illinois, Ohio, and Iowa. Levels were above average in Ohio and most of Iowa and mixed with respect to long-term averages in Minnesota and Michigan.

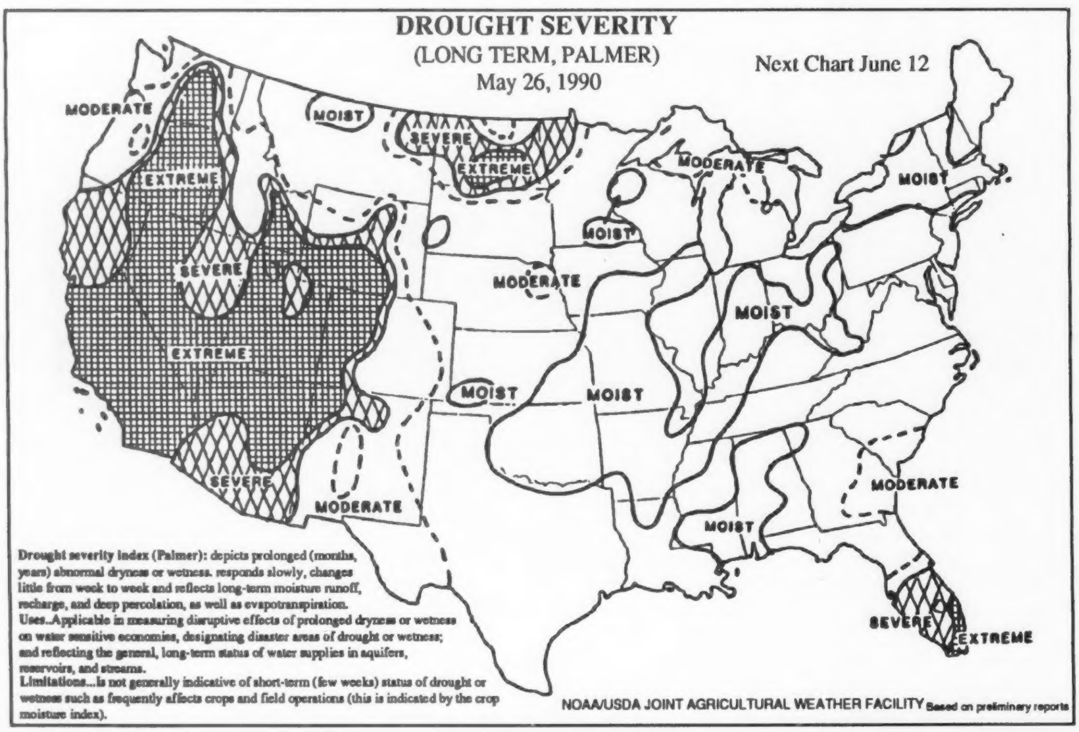
In the Western States, ground-water levels rose in Washington, fell in Utah and most of New Mexico and Texas, and elsewhere were mixed with respect to last month's levels. Levels were below long-term averages throughout much of the West including most of Idaho, North Dakota, Nebraska, southern California, Nevada, and Utah, Kansas, Arizona and Texas. Levels were mixed with respect to average in Washington and New Mexico. Levels declined to record lows in key wells at Rupert, Minidoka County, Idaho; Dickinson, Stark County, North Dakota; Baldwin Park, Los Angeles County, California; Holladay, Salt Lake County, Utah; Halstead, Harvey County, Kansas; and El Paso, El Paso County, Texas. Despite net rises in levels, May lows also occurred in key wells in Wyndmere, Richland County, North Dakota; and Las Vegas Valley, Clark County, Nevada. Level in the well at Logan, Cache County, Utah, was the same as the previous May low, set last year. A record high for May occurred in the key well at Berrendo-Smith, Chaves County, New Mexico, despite a decline in level since last month.

Provisional data; subject to revision

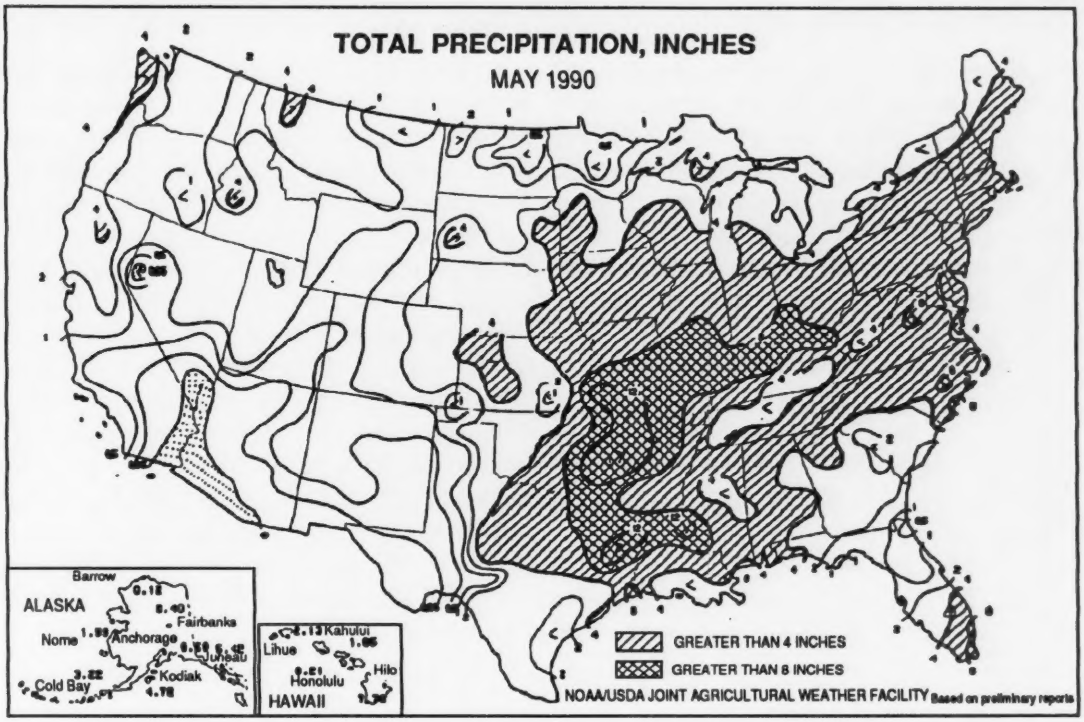
WATER LEVELS IN KEY OBSERVATION WELLS IN SOME REPRESENTATIVE AQUIFERS IN THE CONTERMINOUS UNITED STATES–MAY 1990

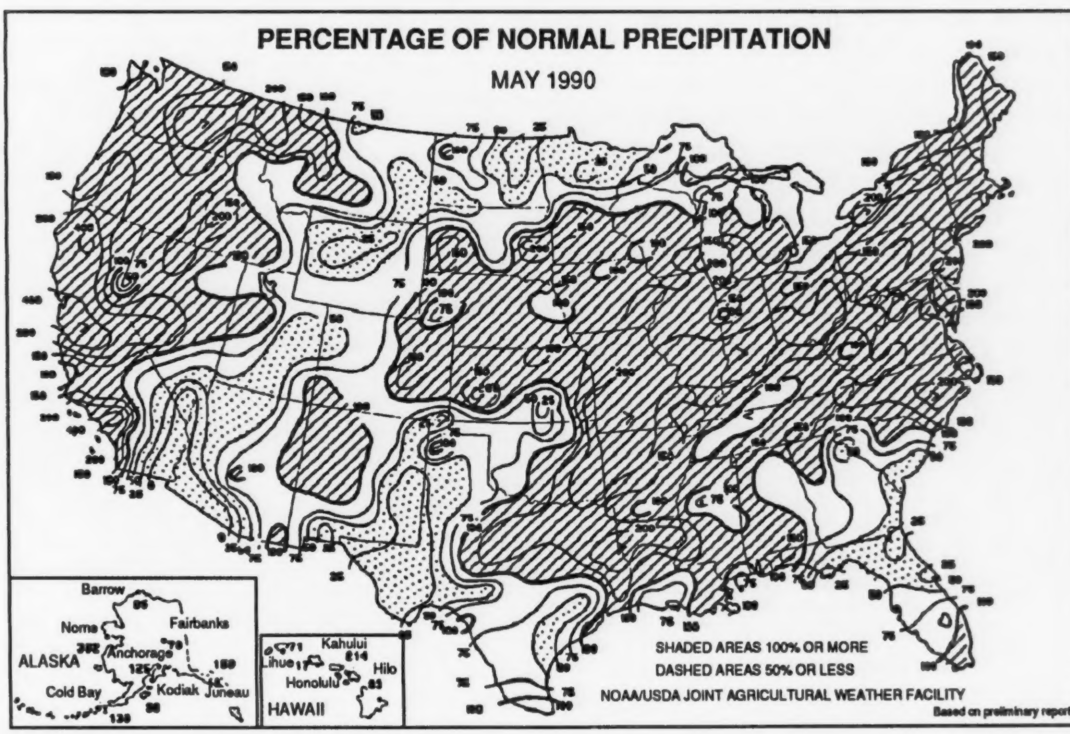
Aquifer and Location	Water level in feet with reference to land–surface datum	Departure from average in feet	Net change in water level in feet since: Last month	Last year	Year records began	Remarks
Glacial drift at Hanska, south–central Minnesota	–10.50	–4.90	+3.07	–3.65	1942	
Glacial drift at Roscommon in north–central part of Lower Peninsula, Michigan.	–4.16	–0.21	+0.30	–0.06	1935	
Glacial drift at Marion, Iowa	–2.66	+1.05	+1.45	+1.99	1941	
Glacial drift at Princeton in northwestern Illinois	–5.59	+2.34	+0.31	+2.06	1943	
Petersburg Granite, southeastern Piedmont near Fall Zone, Colonial Heights, Virginia.	–14.48	+0.32	–0.12	–1.62	1939	
Glacial outwash sand and gravel, Louisville, Kentucky (U.S. well no. 2).	–18.19	+6.17	+0.48	+0.93	1946	
500–foot sand aquifer near Memphis, Tennessee (U.S. well no. 2).	–106.17	–15.96	–0.01	+0.19	1941	
Weathered granite, Mocksville area, Davie County, western Piedmont, North Carolina.	–13.61	+5.55	+1.13	+2.81	1932	
Sparta Sand in Pine Bluff industrial area, Arkansas	–238.75	–29.34	–0.95	+1.25	1958	
Eutaw Formation in the City of Montgomery, Alabama (U.S. well no. 4).	–24.2	–3.1	–3.3	+2.7	1952	
Upper Floridan aquifer on Cockspur Island, Savannah area, Georgia (U.S. well no. 6).	–35.86	–8.48	+0.01	+0.94	1956	
Sand and gravel in Puget Trough, Tacoma, Washington.	–102.33	+6.15	+0.55	+0.01	1952	
Pleistocene glacial outwash gravel, North Pole, northern Idaho (U.S. well no. 3).	–464.6	–3.7	+1.6	+4.1	1929	
Snake River Group: Snake River Plain Aquifer, at Eden, Idaho (U.S. well no. 4).	–125.1	–4.0	+3.0	+1.3	1957	
Alluvial valley fill in Flowell area, Millard County, Utah (U.S. well no. 9).	–39.16	–2.89	–5.04	–5.66	1929	
Alluvial sand and gravel, Platte River Valley, Ashland, Nebraska (U.S. well no. 6).	–5.63	–1.46	+0.50	+1.28	1935	
Alluvial valley fill in Steptoe Valley, Nevada	–6.99	+4.97	–0.24	–0.21	1950	
Pleistocene terrace deposits in Kansas River valley, at Lawrence, northeastern Kansas.	–21.89	–1.36	+1.07	+2.03	1953	
Alluvium and Paso Robles clay, sand, and gravel, Santa Maria Valley, California.	–155.00	–15.14	–2.00	–8.42	1957	
Valley fill, Elfrida area, Douglas, Arizona (U.S. well no. 15).	–100.76	–18.04	–0.84	–0.97	1951	
Hueco bolson, El Paso area, Texas	–271.42	–20.14	–0.43	–0.38	1965	May low
Evangeline aquifer, Houston area, Texas	–301.20	–4.48	–0.28	–5.17	1965	





(From *Weekly Weather and Crop Bulletin* prepared and published by the NOAA/USDA Joint Agricultural Facility)



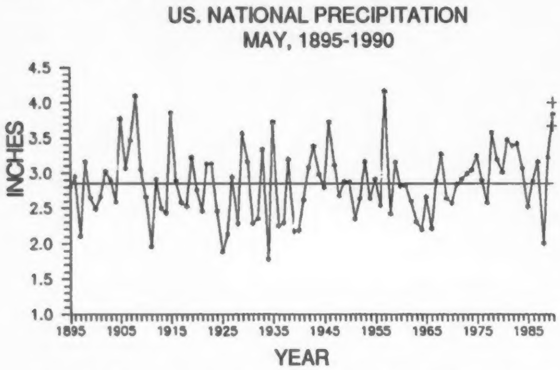


(From *Weekly Weather and Crop Bulletin* prepared and published by the NOAA/USDA Joint Agricultural Facility)

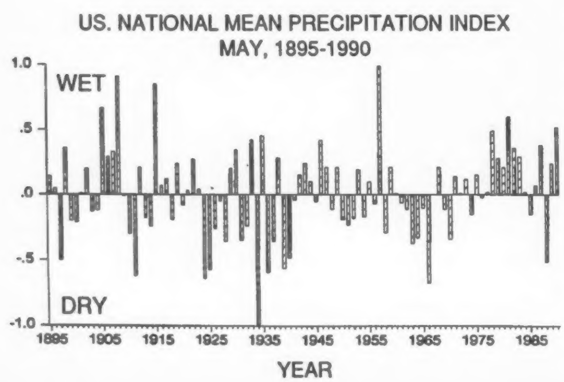
PRECIPITATION IN HISTORICAL PERSPECTIVE

(From *UNITED STATES MAY CLIMATE IN HISTORICAL PERSPECTIVE*, Climate Perspectives Branch, Global Climate Lab, NCDC, NOAA)

Preliminary data for May 1990 indicate that areally-averaged precipitation for the Nation was much above the long-term mean, ranking May 1990 as the fourth wettest May on record. The preliminary value for precipitation is estimated to be accurate to within 0.16 inches and the confidence interval is plotted as a '+'. May 1989 and 1990 mark a return to the unusual wetness that characterized the Mays of the late 1970's and early 1980's.

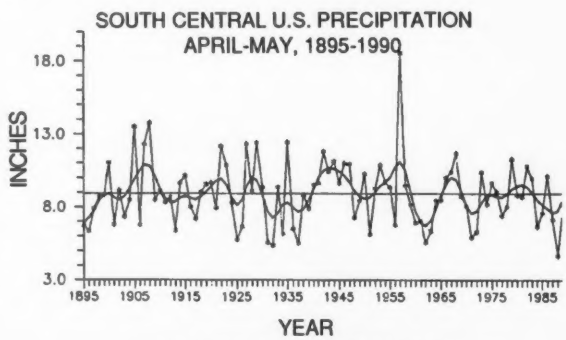


Historical precipitation is shown in a different way below. The May precipitation for each climate division in the country was first standardized using the gamma distribution over the 1951-80 period. These gamma-standardized values were then weighted by area and averaged to determine a national standardized precipitation value. Negative values are dry, positive are wet. This index gives a more accurate indication of how precipitation across the country compares to the local normal climate. The areally-weighted mean standardized national precipitation ranks May 1990 as the sixth wettest May on record.



Although May 1990 ranked as the fourth wettest May nationally, the rain mostly fell in areas that were already wet or had near-normal conditions. About a fifth of the country continued in the severe to extreme long-term drought categories, although that percentage has been steadily decreasing over the last six months. Only ten other Mays have had a greater drought area. Meanwhile, the percentage of the nation in the severely to extremely moist categories increased to over ten percent.

Widespread heavy rains have brought extensive flooding to parts of the south central U.S. during the last two months. April-May total precipitation from the period 1895-1990 for this area (roughly Arkansas and Oklahoma plus the adjoining parts of Texas, Louisiana, Missouri, and Kansas) is plotted below. April-May 1990 ranks as the third wettest April-May period on record.

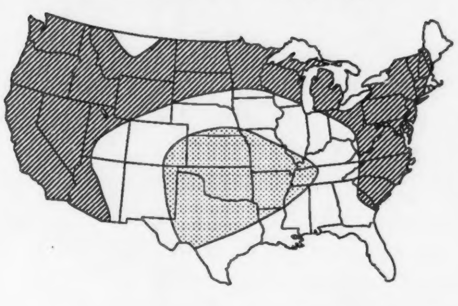


MAY WEATHER SUMMARY

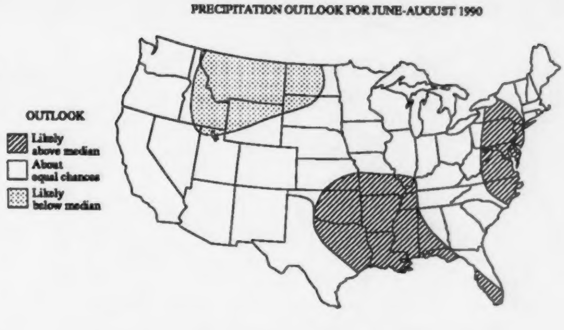
(From *Weekly Weather and Crop Bulletin* prepared and published by the NOAA/USDA Joint Agricultural Facility)

HIGHLIGHTS: Extensive storm systems raked much of the eastern two-thirds of the Nation with severe weather and heavy rains throughout the month. The drenching rains caused widespread flooding and soggy fields which delayed planting in the Corn Belt and South Central States. During the first part of the month, continuing torrential rains produced some of the worst flooding in a century in Oklahoma, Texas, and Arkansas. Unusual late-season Pacific storms caused generally beneficial showers in the West, relieving long-term drought. Dry weather again prevailed over portions of the northern Plains and southern Atlantic Coast States. Heavy rains, however, due in part to the Atlantic Ocean's first tropical depression, did ease long-term drought conditions in southeastern Florida.

TEMPERATURE OUTLOOK FOR JUNE-AUGUST 1990



PRECIPITATION OUTLOOK FOR JUNE-AUGUST 1990



NATIONAL WATER CONDITIONS

MAY 1990

Based on reports from the Canadian and U.S. Field offices; completed June 27, 1990

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EXPLANATION OF DATA (Revised December 1989)

Cover map shows generalized pattern of streamflow for the month based on provisional data from 186 index gaging stations—18 in Canada, 166 in the United States, and 2 in the Commonwealth of Puerto Rico. Alaska, Hawaii, and Puerto Rico inset maps show streamflow only at the index gaging stations that are located near the point shown by the arrows. Classifications on map are based on comparison of streamflow for the current month at each index station with the flow for the same month in the 30-year reference period, 1951-80. Shorter reference periods are used for one Canadian index station, two Kansas index stations, and the Puerto Rico index stations because of the limited records available.

The ***streamflow ranges map*** shows where streamflow has persisted in the above- or below-normal range from last month to this month and also where streamflow is in the above- or below-normal range this month after being in a different range last month. Three ***pie charts*** show: the percent of stations reporting discharges in each flow range for both the conterminous United States and southern Canada, and also the percent of area in each flow range for the conterminous United States and southern Canada. The ***bar graph*** shows total mean and total median flow for all reporting stations in the conterminous United States and southern Canada.

The comparative data are obtained by ranking the 30 flows for each month of the reference period in order of decreasing magnitude—the highest flow is given a ranking of 1 and the lowest flow is given a ranking of 30. Quartiles (25-percent points) are computed by averaging the 7th and 8th highest flows (upper quartile), 15th and 16th highest flows (middle quartile and median), and the 23rd and 24th highest flows (lower quartile). The upper and lower quartiles set off the highest 25 percent of flows and lowest 25 percent of flows, respectively, for the reference period. The median (middle quartile) is the middle value by definition. For the reference period, 50 percent of the flows are greater than the median, 50 percent are less than the median, 50 percent are between the upper and lower quartiles (in the normal range), 25 percent are greater than the upper quartile (above normal), and 25 percent are less than the lower quartile (below normal). Flow for the current month is then classified as: in the ***above-normal range*** if it is greater than the upper quartile, in the ***normal range*** if it is between the upper and lower quartiles, and in the ***below-normal range*** if it is less than the lower quartile. Change in flow from the previous month to the current month is classified as ***seasonal*** if the change is in the same direction as the change in the median. If the change is in the opposite direction of the change in the median, the change is classified as ***contraseasonal*** (opposite to the seasonal change). For example: at a particular index station, the January median is greater than the December median; if flow for the current January increased from December (the previous month), the increase is seasonal; if flow for the current January decreased from December, the decrease is contraseasonal.

Flood frequency analyses define the relation of flood peak magnitude to probability of occurrence or recurrence interval. ***Probability of occurrence*** is the chance that a given flood magnitude will be exceeded in any one year. ***Recurrence interval*** is the reciprocal of probability of occurrence and is the average number of years between occurrences. For example, a flood having a probability of occurrence of 0.01 (1 percent) has a recurrence interval of 100 years. ***Recurrence intervals imply no regularity of occurrence***; a 100-year flood might be exceeded in consecutive years or it might not be exceeded in a 100-year period.

Statements about ***ground-water levels*** refer to conditions near the end of the month. The water level in each key observation well is compared with average level for the end of the month determined from the 30-year reference period, 1951-80, or from the entire past record for that well when only limited records are available. Comparative data for ground-water levels are obtained in the same manner as comparative data for streamflow. ***Changes in ground-water levels***, unless described otherwise, are from the end of the previous month to the end of the current month.

Dissolved solids and temperature data are given for five stream-sampling sites that are part of the National Stream Quality Accounting Network (NASQAN). ***Dissolved solids*** are minerals dissolved in water and usually consist predominately of silica and ions of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, and nitrate. ***Dissolved-solids discharge*** represents the total daily amount of dissolved minerals carried by the stream. ***Dissolved-solids concentrations*** are generally higher during periods of low streamflow, but the highest dissolved-solids discharges occur during periods of high streamflow because the total quantities of water, and therefore total load of dissolved minerals, are so much greater than at times of low flow.

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